

TA91 Magnetic Tape Subsystem Owner's Manual

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About This Manual

This manual describes how to operate the TA91 Magnetic Tape Subsystem and is intended for anyone responsible for operating the subsystem. It includes descriptions of the operator's panels and what to do if something goes wrong.

Familiarity with magnetic tape subsystem operation is helpful, but not necessary, when attempting to operate the TA91 subsystem.

The material in this manual is presented in the following chapters:

- Chapter 1, Introduction, describes the subsystem components.
- Chapter 2, Operator Panels and Switch Panels, describes switches and lights on the panels for the tape control unit, tape transport unit, and tape drive.
- Chapter 3, Operating Procedures, describes how to operate the subsystem and how to clean the drives and cartridges.
- Chapter 4, Care and Handling of the Magnetic Tape Cartridge, describes how to handle and care for the cartridges.
- Chapter 5, What to Do if You Have a Problem, describes how to solve problems that can occur.

1

Introduction

1.1 Overview

The TA91 Magnetic Tape Subsystem consists of a tape control unit (TCU) containing one or two tape drives, and up to two tape transport units (TTUs) each containing two or four tape drives. Each TA91 tape drive uses cartridge-enclosed magnetic tape.

The smallest TA91 subsystem consists of one tape control unit and one tape drive. The largest TA91 subsystem, contains one tape control unit with two STI-FIPS adapters and up to 8 tape drives (in any combination) with cartridge loaders.

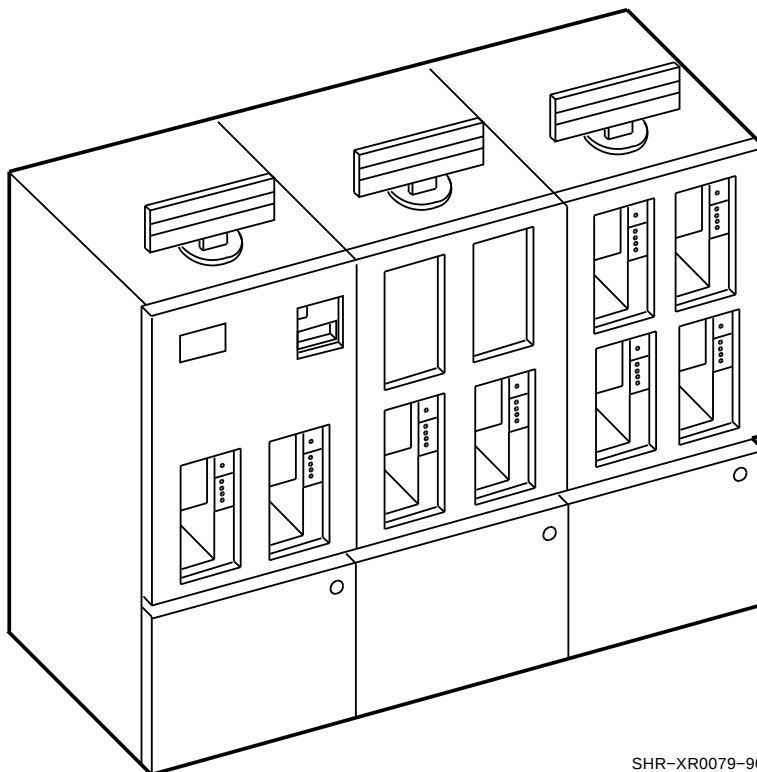
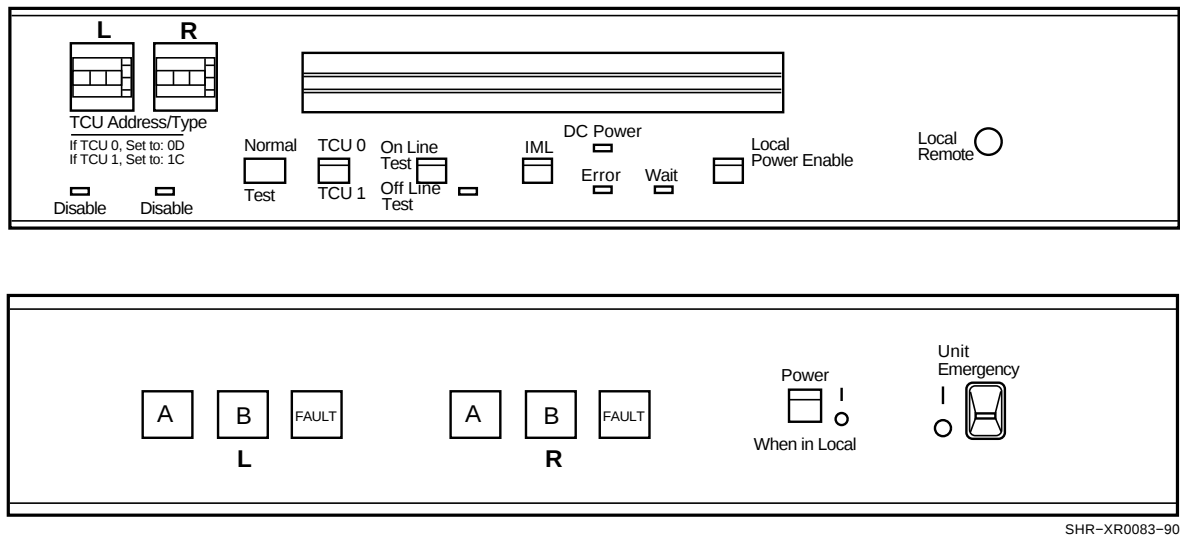


Figure 1-1 TA91 Magnetic Tape Subsystem, Maximum Configuration

1.2 TA91 Tape Control Units

Each TA91 tape control unit contains the hardware for reading and writing data, data error correction, data path control, and data buffering. It also contains microprocessors that manage the data buffers, perform error recovery procedures, and control all tape drive operations.

The tape control unit operator setup panels are located on the rear of the tape control unit (Figure 1-2). The switches in these panels are set when the subsystem is installed, and the settings are not changed during normal operations. The purpose of each switch is important because some switches cause unpredictable results if they are moved while the subsystem is processing work.



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Figure 1-2 Tape Control Unit Operator Setup Panels

1.3 TA91 Tape Transport Units and Drives

The TA91 tape transport units contain compact, self-threading drives that use a magnetic tape cartridge. Each tape transport unit contains two or four tape drives and the mechanical and electrical assemblies necessary to support the drives. Each drive contains a mechanical assembly for moving and threading the tape, electronic circuitry for reading and writing, and a microprocessor that controls tape motion. There are no capstans or vacuum columns.

1.3.1 Operator Panel

Each drive has an operator panel that contains a message display and switches for changing the ready/not ready condition of the drive and for rewinding and unloading tape cartridges.

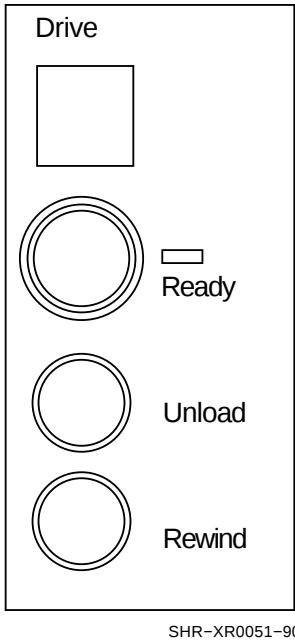


Figure 1-3 Operator Panel for Drive

The message display can show drive condition, drive error information, and messages sent by an attached controlling computer. You can adjust the operator panel to best meet your viewing requirements.

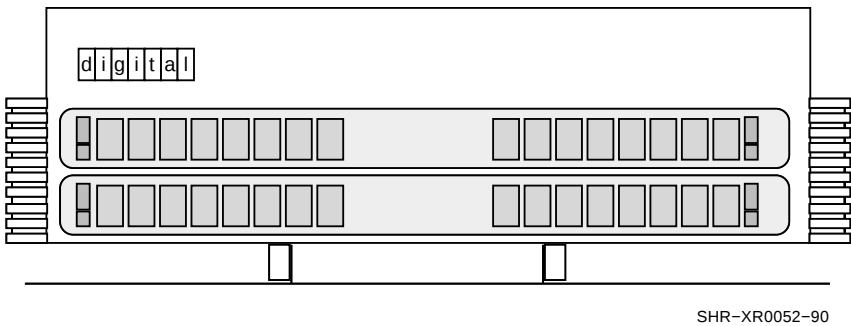
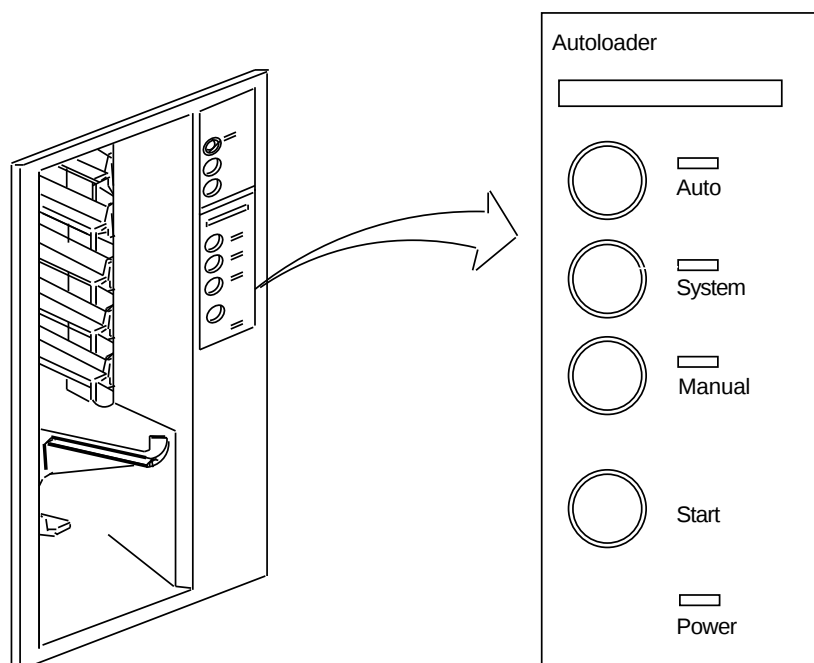


Figure 1-4 Tape Drive Message Display

1.3.2 Cartridge Loader

The cartridge loader is an integral part of each TA91 tape drive. The loader allows both the automatic loading of prestaged tape cartridges, and the manual loading of single tape cartridges Figure 1-5.

The loader operator panel on the front of the loader allows the operator to switch between Auto and Manual modes. It also has a Start switch for initiating loader activity and two indicator lights. The Power light indicates that the correct voltages are present on the loader, and the Attention light indicates when an operator action is required or when an error is encountered.



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Figure 1-5 Cartridge Loader and Panel

1.4 Magnetic Tape Cartridge

The cartridge is closed by a leader block (attached to the end of the tape) to protect the tape from contamination when it is out of the drive (Figure 1-6). When the cartridge is inserted in a drive, the threading mechanism uses the leader block to pull the tape out of the cartridge, across the read/write head, and onto a nonremovable machine reel.

CAUTION

Do not try to pull the leader block away from the cartridge. You could damage the tape and reduce the reliability of the cartridge.

Each tape cartridge includes a File-Protect selector that, when set to the file-protect position, prevents data from being written on or erased from the tape. See Section 3.7.2, Setting the File-Protect Selector.

The tape cartridge has a volume/serial number label on its side (Figure 1-6). A larger customer information label can be mounted on the top of the cartridge.

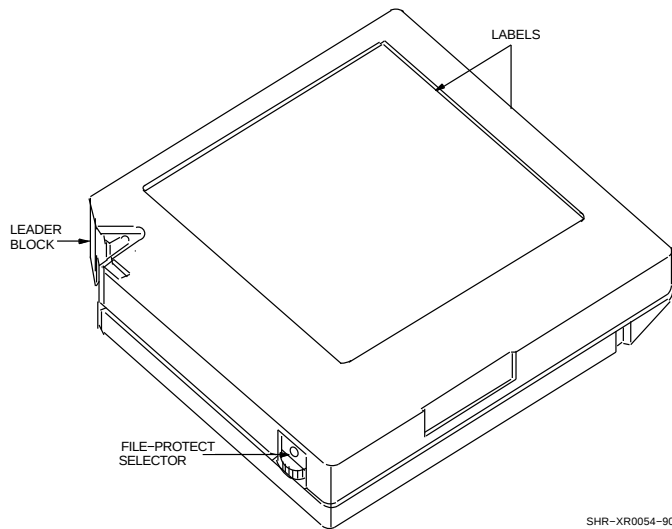
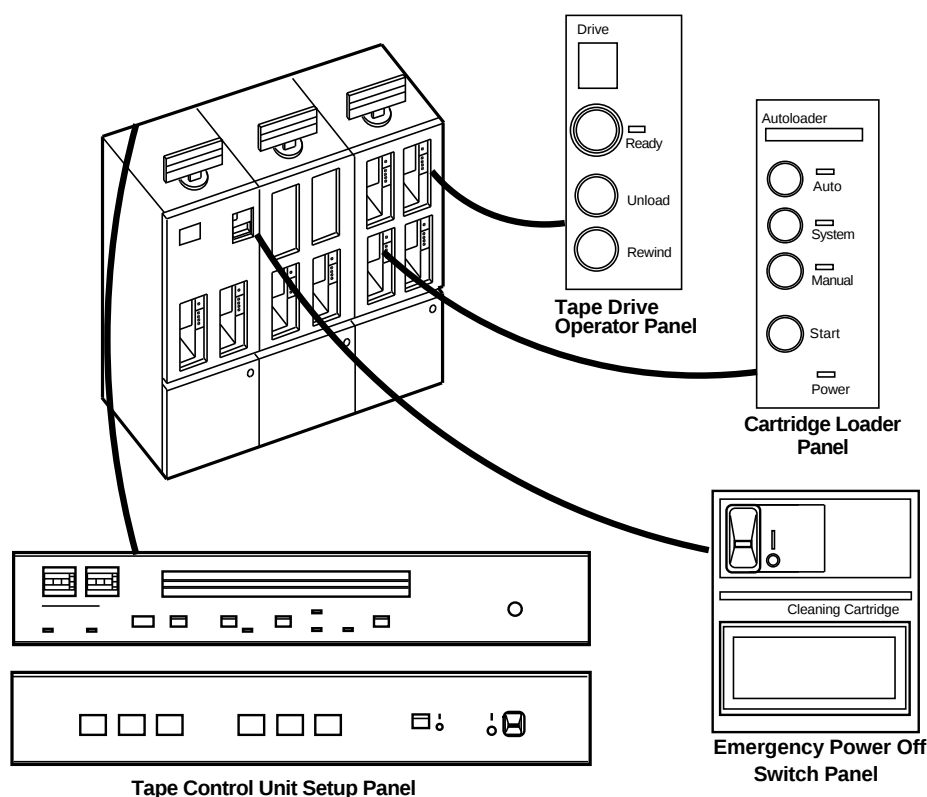


Figure 1-6 TA91 Cartridge Containing Magnetic Tape

Operator Panels and Switch Panels

2.1 Overview

Each tape control unit has two operator panels; a setup panel and an A/B Fault switch panel. Each drive has an operator panel for the drive and an operator panel for the cartridge loader. Although the switches in each panel are not changed during normal operations, they can be manually operated for some conditions (Figure 2-1).



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Figure 2-1 Locations of Operator Panels and Switch Panels

There are two tape control unit Emergency Power Off switch panels; one is located on the front cover of the tape control unit, and the other is located in the rear on the tape control unit setup panel.

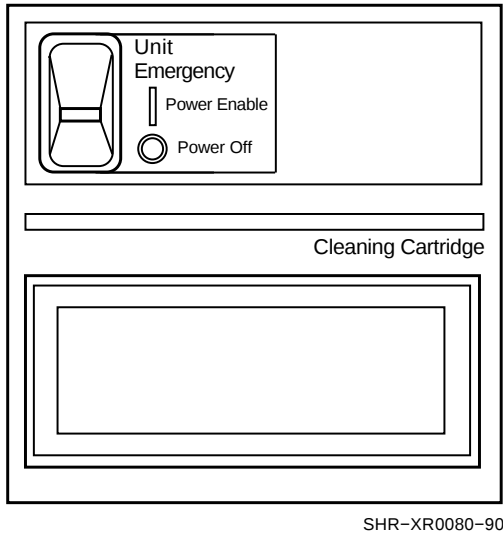


Figure 2-2 Emergency Power Off Switch Panel (Front Cover)

Do not move this switch during normal operations. If the Power On/Off switch is moved accidentally while the tape control unit is operating, the effect on the jobs that are running is unpredictable, and can include data integrity problems, job termination, and so on. If power is lost, see Section 3.4, Restoring Power After Emergency, to restore the power and load the microprogram. Tell the system operator or supervisor about the power loss.

The Unit Emergency Power switch is used to remove power in emergencies, such as water getting into the tape control unit or any of the drives. When this switch is moved to the Power Off position, power is immediately removed from the subsystem.

2.2 Tape Control Unit Operator Setup Panel

The tape control unit operator setup panel has switches and lights that control the subsystem and its relationship to the controlling computer. Although most of the switches and lights on the panel are hidden, the A/B Fault switches, the Power On/Off switch, and the Unit Emergency Power switch are all accessible through an opening in the rear cover of the tape control unit.

The switches and lights that are part of the tape control unit setup panel on the rear of the tape control unit can be used to:

- Switch the tape control unit from normal operation to test operation.
- Switch a tape control unit off-line or on-line.
- Reset the tape control unit after a unit emergency power-off.
- Change the tape control unit addresses.

2.2.1 Power On/Off Switch

Do not move this switch during normal operations. If the Power On/Off switch is moved accidentally while the tape control unit is operating, the effect on the jobs that are running is unpredictable, and can include data integrity problems, job termination, and so on. If power is lost, see Section 3.6, Restoring Power During Normal Operations, to restore the power and load the microprogram. Tell the system operator or supervisor about the power loss.

The Power On/Off switch ❶ supplies or removes power to the tape control unit and its attached tape transport units (Figure 2-3).

When the Remote/Local switch is in the Remote position, power is controlled by the controlling computer or a switching device.

2.2.2 Power On Light

The green Power On light ❷ comes on when power is supplied to the subsystem (Figure 2-3).

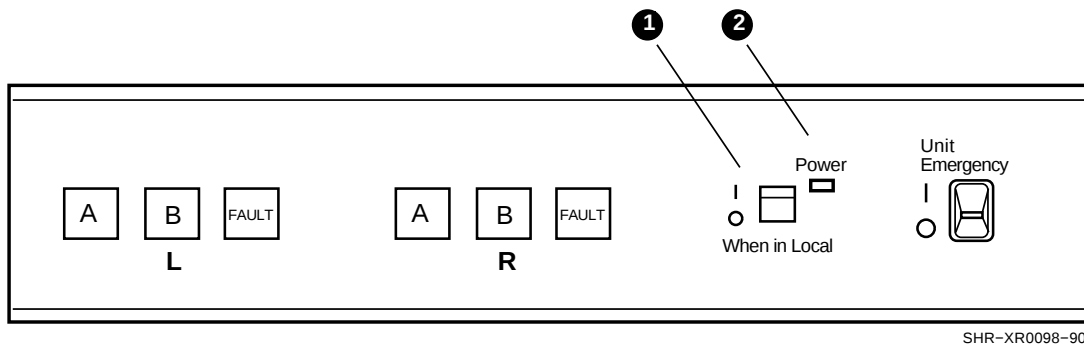


Figure 2-3 Power On/Off Switch and Power On Light

2.2.3 Unit Emergency Power Switch

Do not move this switch during normal operations. If the Unit Emergency Power switch is moved accidentally while the tape control unit is operating, the effect on the jobs that are running is unpredictable, and can include data integrity problems, job termination, and so on. If power is lost, see Section 3.4, Restoring Power After Emergency, to restore the power and load the microprogram. Tell the system operator or supervisor about the power loss.

The Unit Emergency Power switch ③ removes power in emergencies (Figure 2-4). Emergencies include smoke coming from the tape control unit or water getting into the tape control unit or any of the drives. When this switch is moved to the Power Off position, power is immediately removed from the subsystem.

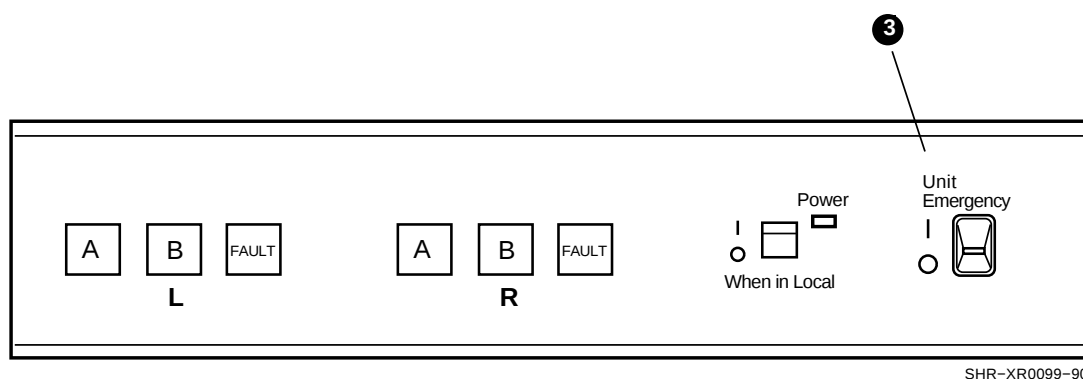


Figure 2-4 Unit Emergency Power Switch

2.2.4 A/B Fault Switches

Do not move these switches during normal operations. If a switch is moved accidentally while the tape control unit is operating, the effect on the jobs that are running is unpredictable, and can include data integrity problems, job termination, and so on. If power is lost, see Section 3.6, Restoring Power During Normal Operations, to restore the power and load the microprogram. Tell the system operator or supervisor about the power loss.

The A/B switches ④ determine which ports can be accessed by an HSC controller. The Fault switches are used to read error codes and reset error conditions.

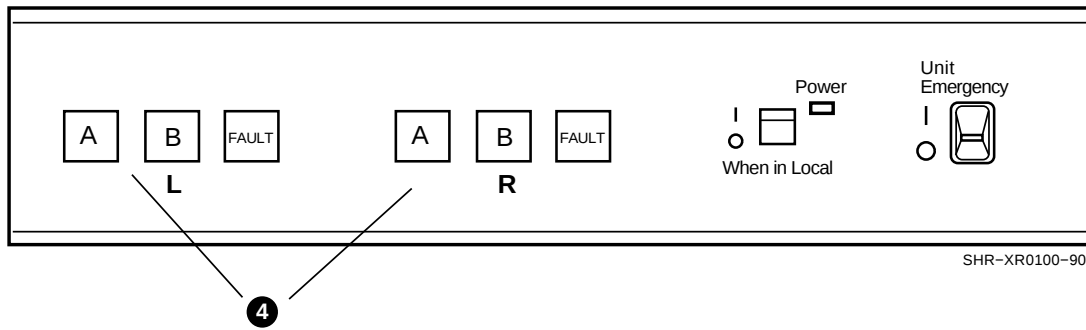


Figure 2-5 A/B Fault Switches

2.2.5 Normal/Test Switch

Do not move this switch during normal operations. If the Normal/Test switch is moved accidentally while the tape control unit is operating, the effect on the jobs that are running is unpredictable, and can include data integrity problems, job termination, and so on. If the switch is moved, return it to the Normal position and tell the system operator or supervisor about the accident.

The Normal/Test switch ❶ controls the tape control unit mode of operation (Figure 2-6). When the switch is in the Normal position, the tape control unit is set for normal operation. When the switch is in the Test position, the tape control unit is set for testing. The tests are maintenance aids used by service representatives.

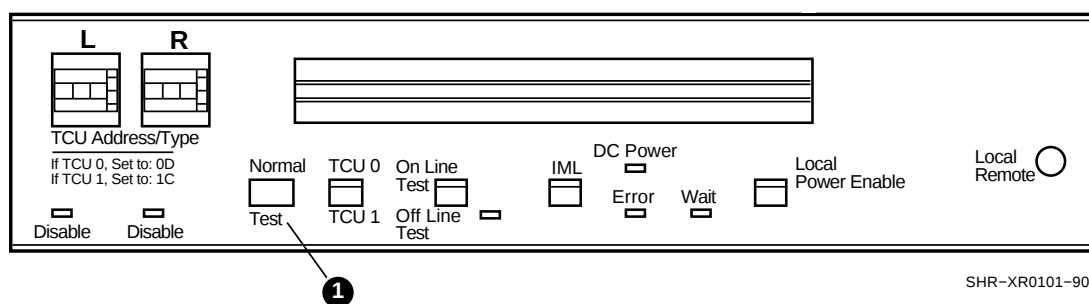


Figure 2-6 Normal/Test Switch

2.2.6 TCU 0/TCU 1 Switch

The TCU 0/TCU 1 switch ❷ identifies the tape control unit (Figure 2-7). This switch is set to TCU 0 at installation and should not be changed after the subsystem is installed.

2.2.7 On Line Test/Off Line Test Switch

Do not move this switch during normal operations. If the switch is moved accidentally while the tape control unit is operating, the effect on jobs that are running is unpredictable, and can include data integrity problems, job termination, and so on. If one switch is moved, return the switch to the On Line Test position and tell the system operator or supervisor about the accident.

The position of the On Line Test/Off Line Test switch ❸ determines whether the tape control unit can communicate with the controlling computer (Figure 2-7).

When the switch is in the On Line Test position, the tape control unit can communicate with the controlling computer. When the switch is in the Off Line Test position, the tape control unit cannot communicate with the controlling computer.

When the On line Test/Off line Test switch is moved to the Off Line Test position during normal operations, the tape control unit completes processing of all the work in the subsystem and returns subsystem status to the controlling computer. This process can take up to five minutes before the subsystem becomes off-line. The TCU Off Line light ❹ comes on to show when the tape control unit is off-line.

For normal operation, the switch should be in the On Line Test position.

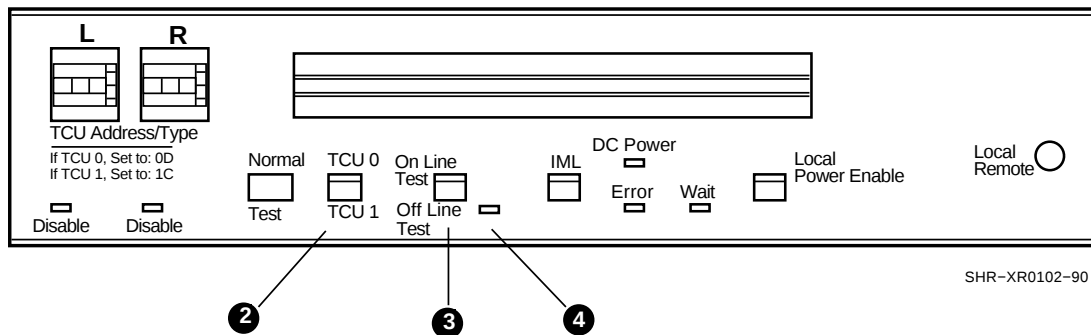


Figure 2-7 On Line Test/Off Line Test Switch, TCU0/TCU1 Switch

2.2.8 TCU Off Line Light

The green TCU Off Line light ⑤ comes on when the On Line Test/Off Line Test switch is set to Off Line Test, all subsystem processing has completed, and subsystem status has been to the controlling computer (Figure 2-8).

NOTE

There can be a short delay (up to five minutes) between when the On Line Test/Off Line Test switch is placed in the Off Line Test position and when the TCU Off Line light comes on.

The TCU Off Line light is off and the subsystem is on-line when data is being transferred between the subsystem and a controlling computer.

When the TCU Off Line light is off, do not switch the power off.

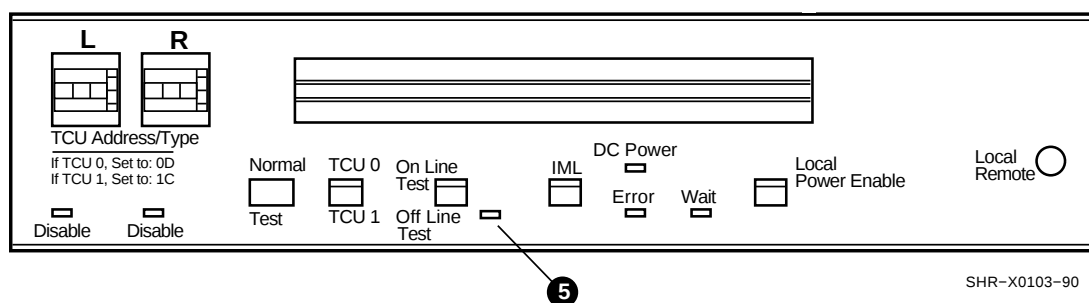


Figure 2-8 TCU Off Line Light

2.2.9 IML Pushbutton

CAUTION

If this pushbutton is accidentally moved during subsystem operation, and the On Line Test/Off Line Test switch is in the Off Line Test position, all the data in the buffer is destroyed. If this happens, tell the system operator or supervisor about the accident.

The IML pushbutton ⑥ resets internal controls in the tape control unit (Figure 2-9). Pressing this pushbutton causes all information that was supplied by any controlling computer to the tape control unit to be erased, including buffered data. Generally, this pushbutton is not used during normal operations. The IML pushbutton will not function unless the tape control unit On Line Test/Off Line Test switch is set to Off Line Test. After setting the switch to the Off Line Test position, wait for the Off Line Test light to come on before pressing the IML pushbutton.

When the pushbutton is pressed, the tape control unit begins the initial microprogram load (IML) procedure. See Section 3.2, Loading the Microprogram into the Tape Control Unit, for more information about the IML procedure.

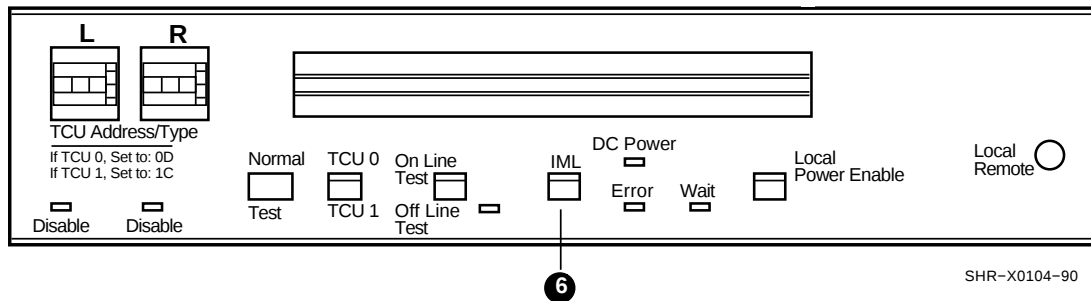


Figure 2-9 Initial Microprogram Load (IML) Pushbutton

2.2.10 DC Power Light

The tape control unit DC Power light ⑦ is on when dc power is supplied to the tape control unit (Figure 2-10).

2.2.11 Error Light

The Error light ⑧ comes on when an error has been detected (Figure 2-10). If the light is blinking, the error was detected by the microprogram but does not affect tape control unit integrity. If the light is constantly on, the error was detected by the hardware, and the tape control unit is disabled.

2.2.12 Wait Light

The Wait light ⑨ blinks while the subsystem is operating (Figure 2-10). When the subsystem is waiting for work, the light is constantly on. When the light is constantly off, the subsystem has had an error.

2.2.13 Disable Lights

The Disable light ⑩ for each STI-FIPS interface either blinks or stays on during power-up and turns off after a normal power-up (Figure 2-10). If the light is on after normal power-up, subsystem communication on the corresponding interface is prevented.

An error in communication between the controlling computer and the tape subsystem cause the interface to be disabled and the Disable light to come on.

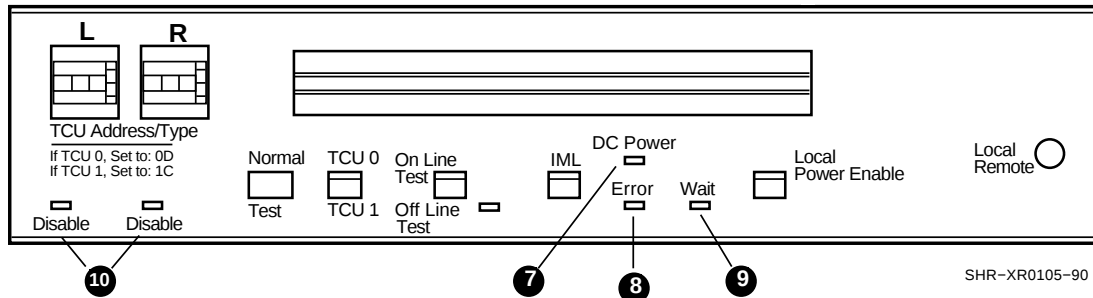


Figure 2-10 DC Power, Error, Wait, and Disable Lights

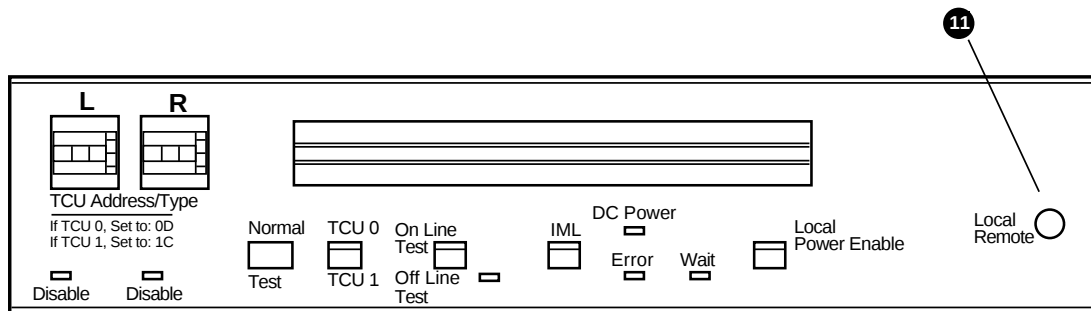
2.2.14 Remote/Local Switch

CAUTION

Do not move this switch during normal operations in a subsystem that does not have an emergency power off (EPO) connection to the controlling computer. If the switch is moved accidentally while the tape control unit is operating, the effect on jobs that are running is unpredictable, and can include data integrity problems, job termination, and so on. Tell the system operator or supervisor about the accident.

The Remote/Local switch ⑪ determines what part of the system controls power to the subsystem (Figure 2-11). The Remote position is not supported in the TA91. When the switch is in the Local position, the tape control unit controls the power to the subsystem.

The effect of moving the switch accidentally while the tape control unit is operating depends on whether the subsystem has an emergency power off (EPO) connection to the controlling computer. See the Caution above for a subsystem that does not have an EPO connection. In a subsystem that does have an EPO connection to the controlling computer, moving this switch accidentally while the tape control unit is operating does not affect the jobs that are running. Return the switch to its original position.



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Figure 2-11 Remote/Local Switch

2.2.15 Local Power Enable Pushbutton

The Local Power Enable pushbutton ⑫ resets the ac power supply to permit power to be applied to the tape control unit (Figure 2-12). The Unit Emergency Power switch must be in the Power Enable position.

If the switch is moved accidentally while the tape control unit is operating, the jobs that are running are not affected. No operator action is required.

2.2.16 TCU Address Switches

If one of these switches is moved accidentally while the tape control unit is operating, the jobs that are running are not affected (Figure 2-12). **However, do not leave the switch in the incorrect position.** Return the switch to the original position as indicated by the label. If the switch is not returned to the original position, unpredictable results could occur.

The TCU address switches ⑬ are set according to the tape control unit addresses. These switches were set for TCU0 when the subsystem was installed and usually are not changed.

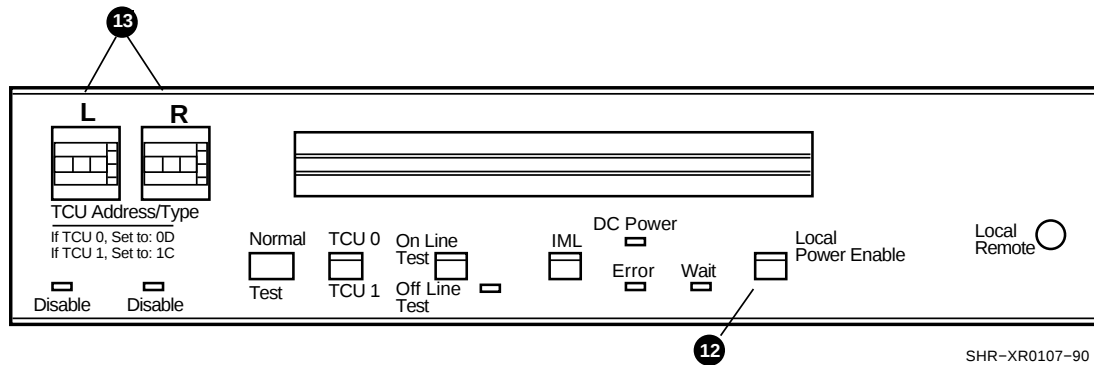


Figure 2-12 TCU Address Switches and Local Power Enable Pushbutton

2.3 Tape Drive Operator Panel

Each tape drive in the subsystem contains an operator panel and display, and each tape transport unit has a display (see Figure 2-14). The panel has switches and lights that can be used to:

- Rewind tape.
- Unload tape.
- Place the drive in a Ready or Not Ready condition.

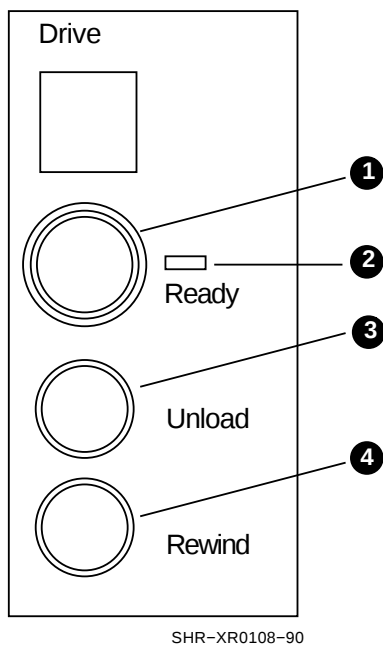


Figure 2-13 Drive Operator Panel

2.3.0.1 Ready Switch

Do not move this switch during normal operations. If the switch is moved accidentally while the drive is operating, the effect on the job that is running on this drive is unpredictable, and can include data integrity problems, job termination, and so on. Move the switch back to the Ready position and tell the system operator or supervisor about the accident.

The Ready switch ❶ places the drive in a ready or not ready condition. When the switch is in the ready position, the ready light is on and the drive is prepared to read data from, or write data to, a magnetic tape. When the switch is in the not ready position, the ready light is off and the drive cannot read or write data. This switch must be in the not ready position for the Rewind switch or the Unload switch to work, unless a check condition has already caused the drive to lose its ready condition.

2.3.0.2 Ready Light

The green ready ② light is on when the drive is in a ready condition. When a cartridge is loaded, the drive goes into a ready state indicated by a READY message on the drive display.

2.3.0.3 Unload Switch

The Unload switch ③ rewinds the tape completely into the cartridge and releases the leader block. The cartridge is ejected into the cartridge loader when the unload operation completes. You can then remove the cartridge from the drive. The Unload switch works only when the Ready light is off, or if a check condition has caused the drive to lose its ready condition.

Pressing the Unload switch resets the drive and resets any check code messages on the message display. The Unload switch is sometimes used in error recovery procedures for the cartridge loader.

If the switch is moved accidentally while the drive is ready, there is no effect. However, if the drive is not ready, the drive rewinds and unloads the tape.

2.3.0.4 Rewind Switch

The Rewind switch ④ rewinds the tape into the cartridge to the beginning-of-tape (BOT). The Rewind switch works only when the Ready light is off.

If the switch is moved accidentally while the drive is ready, there is no effect. However, if the drive is not ready, the drive rewinds the tape.

2.3.1 Tape Drive Message Display

The message display allows you to view messages that inform you of drive condition or required actions. Each message display unit has four 8-digit displays, one for each of the tape drives. The top two 8-digit displays are for the top two drives and the bottom two 8-digit displays are for the bottom two drives.

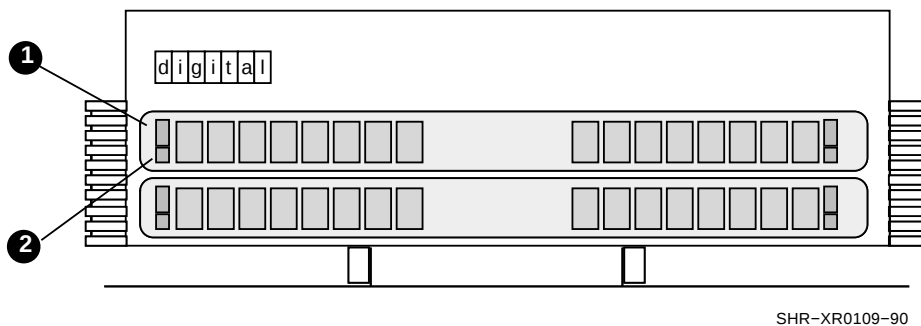


Figure 2-14 Tape Drive Message Display

2.3.1.1 Attention Light

The yellow attention light ① is on when action is required to permit operations on the drive. The message display indicates the required action. If the Attention light is off, no action is required, even though a message is displayed. For example, if an **E.O.T.** message is displayed, the attention light will be off, indicating the message is for information only.

2.3.1.2 Selected Light

The green selected light ② is on when the tape control unit is communicating with the drive.

2.3.1.3 Display Panel Adjustments

The display uses 25 mm (1 inch) high characters and has a wide range of independent adjustments:

- 175 ° of left-right rotation
- 45 ° of tilt angle
- 29 cm (11.5 inches) of vertical movement.

You cannot, however, turn the panel completely around to view it from the rear of the tape transport unit. Detents hold the panel steady at any of its positions. You can stop the panel between the detents, but it is not held firmly in position.

To rotate the panel:

Firmly grasp each end of the panel

1. Apply enough left or right pressure to overcome the detent
2. Move the panel until it stops at a detent in the desired position

To tilt the panel:

1. Firmly grasp each end of the panel
2. Apply enough forward or backward pressure to overcome the detent
3. Move the panel until it stops at a detent in the desired position

To raise or lower the panel:

1. Firmly grasp each end of the panel
2. Apply up- or down-ward pressure to overcome the friction in the pivot arms
3. Move the panel until it is in the desired position

2.3.1.4 Display Messages

The message display shows messages that indicate drive condition. Four messages can be displayed:

- Mount and dismount
- Drive condition
- Check code
- Subsystem information

The message display has eight character positions (Figure 2–15).

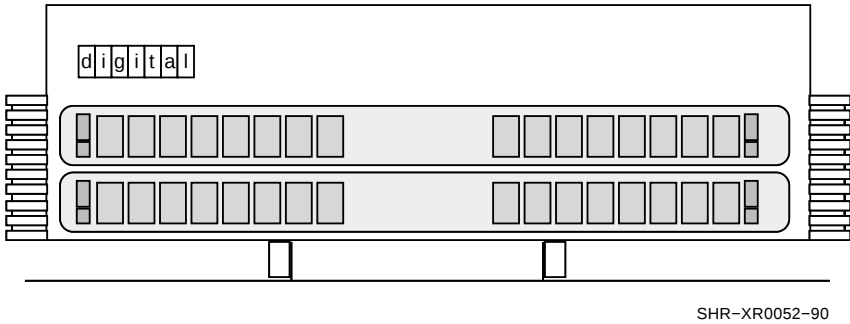


Figure 2-15 Message Display

The eighth (last) position sometimes modifies the specified operator action or gives additional information. For example, an **F** displays when the cartridge is file-protected. Displayed messages can extend across all eight character positions, for example: UNLOADING. In addition, two-part messages display each part alternately (Figure 2-15). For example, the two-part message D XXXXXX and M XXXXXX is displayed as D XXXXXX then M XXXXXX, D XXXXXX then M XXXXXX.

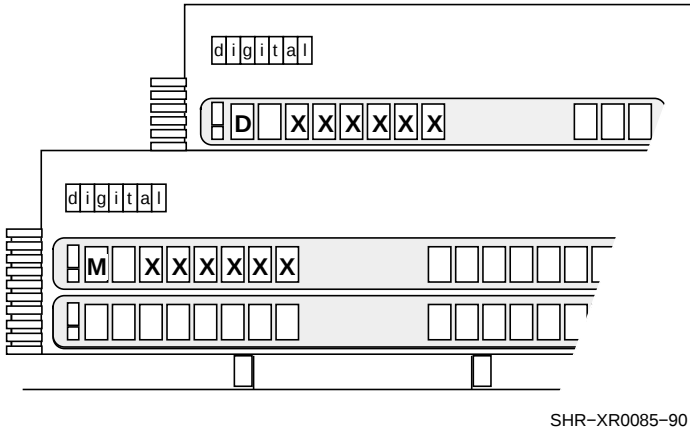


Figure 2-16 Displaying a Two-Part Message

2.3.1.5 Drive Condition Messages

With any operating system, a drive condition message appears on the message display when the drive condition changes. The following table shows the drive condition messages and their meanings.

Table 2-1 Drive Condition Messages and Their Meanings

Message	State	Explanation
READY	(steady)	This message appears when a drive has tape motion. The U means that the tape is unprotected (not file protected). An F in the last display position means the tape is file protected.

Table 2-1 (Cont.) Drive Condition Messages and Their Meanings

Message	State	Explanation
REWINDING	(steady)	A tape is being rewound
UNLOADING	(steady)	A tape is being unloaded. The load process is complete when the cartridge is ejected to the loader.
DR #	(steady)	After successful IML, all drives show their drive numbers (see Note).
*	(steady)	The cartridge has been removed by the operator. The drive is empty.
NT RDY U	(steady)	The tape is not ready (for example, the Ready light is off). The letter U or F in the last display position indicates the file protection setting.

The NT RDY message can be either hardware or software generated. The hardware-generated NT RDY does not blink. It displays whenever the device is not ready and has no outstanding I/O request. The software-generated NT RDY blinks whenever an I/O request is issued and the device is found not ready.

NOTE

An asterisk (*) may display when power is restored after a power failure. If a cartridge is still in a drive when the IML procedure completes, an asterisk displays and the cartridge unloads.

2.3.1.6 Check Code Messages

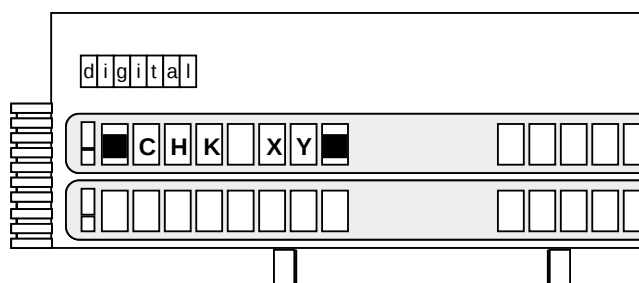
A check code message appears on the message display when a hardware error is detected in the drive (Figure 2-17). This message has priority over the other kinds of messages and **is not replaced by any other message until the error is corrected.** The customer engineer uses the check code to identify the cause of the error. The check code message has the following format on the message display:

()CHK XY ()

The first and last characters are special symbols and **XY** is the hexadecimal error code.

Please note that if a **CHK XY** message displays, the special symbols do not mean that the drive is off line.

When a check code message displays, see Appendix B, Check Code Table. If service is required, record the check code and give it to the customer engineer.



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Figure 2-17 Displaying Check Codes

2.4 Cartridge Loader Operator Panel

This panel has switches and indicators to control and monitor the cartridge loader (Figure 2-18).

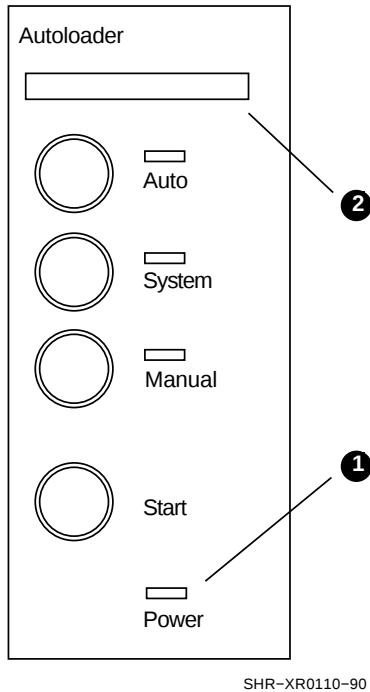


Figure 2-18 Cartridge Loader Operator Panel

2.4.1 Indicators

There are several indicator lights on the loader operator panel:

- The green indicator ❶ is the power indicator. This is on when the voltages required by the cartridge loader are present.
- The yellow attention indicator ❷ has two functions.
 - When the indicator is flashing, the input stack is empty, the output stack is full, or some other operator service is required. See Section 5.7, Cartridge Loader Recovery Procedure.
 - When the indicator is on continuously (not flashing), an error has been detected by the loader, and operator intervention is required to attempt recovery. See Section 5.7, Cartridge Loader Recovery Procedure for additional information.
- The other indicators are used to show which mode of operation has been selected.

2.4.2 Mode Selection Switches

These switches control the mode in which the cartridge loader operates. The two modes are Auto ③ and Manual ④.

Auto and manual modes run on any operating system that supports the TA91 subsystem.

System mode is not currently supported although a System mode switch exists.

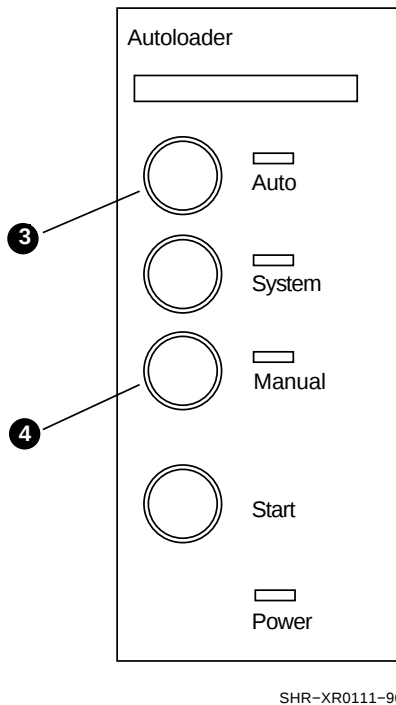


Figure 2-19 Cartridge Loader Mode Selection Switches

2.4.2.1 Auto Mode

The following is a general description of Auto mode. For step-by-step procedures on how to use Auto mode, see Section 3.9.1, Using Auto Mode.

Auto mode allows an operator to prestage up to six cartridges, which are automatically loaded as the preceding cartridge is unloaded (Figure 2-19).

Auto mode is most effective for:

- Loading only one cartridge at a time, when the operator wants the cartridge automatically indexed (moved) to the output stack. This frees the drive for the input of the next cartridge, and allows the operator to remove the processed cartridge when it is convenient, or when the output stack is full (six cartridges).
- Prestaging scratch cartridges when it is known that *only* scratch cartridges are going to be requested by the system.
- Prestaging cartridges for applications when multiple cartridges are required and the operator knows which cartridges are required and in what order.

2.4.2.2 Manual Mode

The following is a general description of Manual mode. For step-by-step procedures on how to use Manual mode, see Section 3.9.2, Using Manual Mode.

Manual mode allows the manual insertion and removal of tape cartridges (Figure 2–19).

Manual mode is most effective:

- When you want the loader to function like a TA91 tape drive without the loader feature.
- When you want to hold premounted cartridges in the input stack until the job that requires them is run. The Start switch must be pressed to start loader operation.
- When you want to stop the cartridge feeding and loading in auto mode. Any function in progress is completed before the loader switches to Manual mode. For example, if a cartridge was being processed on the drive, it would continue to process until finished, then unload to the feed position.
- When you want to permit continued use of a drive if the indexing function of the loader fails.
- When you want to raise and maintain an empty output stack to allow maintenance on the adjacent drive. Some maintenance procedures require that the output stack be in the fully raised (unloaded) position. Manual mode does not use the output stack, allowing continued use of the drive.
- When using those applications that require only one cartridge.

2.4.2.3 Changing Modes

Modes can be changed at any time. If a function is in progress at the time, it will complete before the loader switches to the new mode. For example, if a cartridge was being processed on the drive, it would process until finished, then unload.

After using the mode selection switch to change modes, the operator must press the Start switch to restart loader operations. However, any operator actions (such as inserting cartridges) should be performed before pressing the Start switch.

If a cartridge unloads to the feed position in Manual mode, and then you change modes, the loader will recognize that the cartridge in the feed position has been processed. If you remove the processed cartridge from the feed position, and reinsert or replace it with another cartridge, the loader recognizes it as a new cartridge.

If you switch from Auto mode to Manual mode while a cartridge is loaded, that cartridge unloads to the feed position when it is through processing, and must be removed manually.

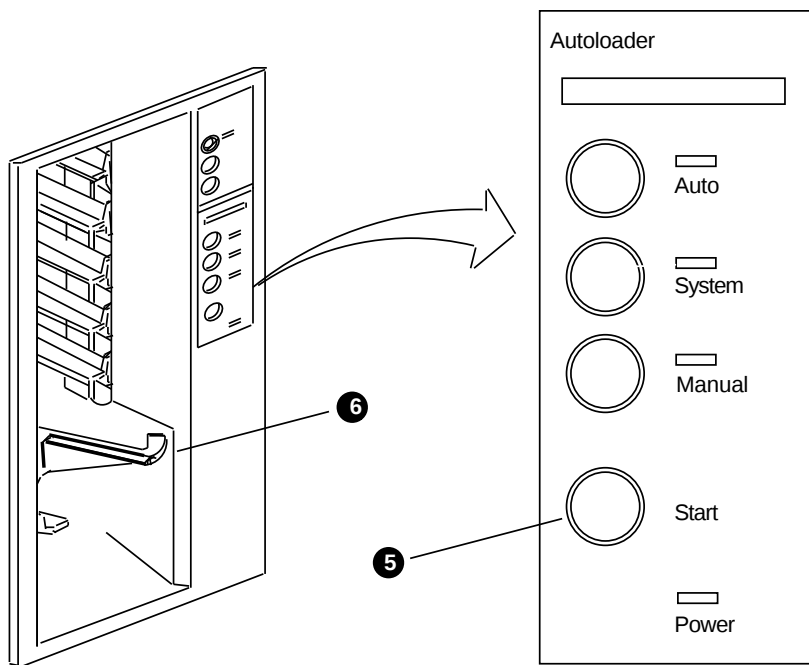
2.4.3 Start Switch

Press the Start switch ⑤ to cause an index and/or load procedure to occur or, under error conditions, an unload procedure to occur (Figure 2-20).

Press the Start switch for the following conditions:

- After changing the mode selection switch between Auto or Manual to start activity in the new mode
- To restart activity after some required operator action has been performed
- To allow recovery actions to continue after a problem
 - Pressing the Start switch allows recovery actions to continue after cartridges have been manually removed from the feed position or output stack in response to a problem.
 - After a subsystem IML or after a load request to the TA91 tape control unit, a cartridge may be unloaded to the output stack with the output tray ⑥ remaining up. Pressing the Start switch allows the cartridge to be removed from the loader.

The Start switch is ignored if it is pressed when not required.



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Figure 2-20 Cartridge Loader Start Switch

Operating Procedures

3.1 Overview

Operating the TA91 subsystem requires several procedures. These include:

- Loading the microprogram into the tape control unit
- Removing and restoring power to the subsystem
- Setting the File-Protect selector on a cartridge
- Loading and unloading a tape cartridge
- Rewinding loosely wound tape
- Loading and unloading tape cartridges on drives with the cartridge loader

3.2 Loading the Microprogram into the Tape Control Unit

The subsystem microprogram must be loaded into each tape control unit whenever power is turned on, or if an error occurs that disrupts the microprogram.

The microprogram is contained on a 3½ inch diskette that is inserted into the diskette reader. The customer engineer puts the diskette into the reader when the subsystem is installed. Generally, the diskette remains in the reader at all times.

The tape control unit starts the procedure for loading the microprogram, called initial microprogram load (IML), when power is turned on at the tape control unit. When the IML starts, the light on the diskette reader comes on and the Wait light starts blinking. If the IML completes successfully, the light on the diskette reader goes off, and the Wait light stays constantly on. However, if the IML does not complete successfully, the diskette reader light goes off and the Error light comes on.

If the diskette is not inserted in the diskette reader when power is turned on at the tape control unit, the IML cannot start automatically.

While the IML procedure is running, the light on the front of the diskette reader is on and the Wait light is blinking. When the IML procedure completes successfully, the diskette reader light goes off, the Wait light stays constantly on, and the Disable lights go out. If one of the Disable lights fails to go out, refer to Section 5.3 for instructions. If an error occurs that prevents the microprogram from loading successfully, the Error light comes on instead of the Wait light. If the IML procedure is not successful, refer to Section 5.3 for instructions.

For normal tape control unit operations following the IML, the TCU On Line Test/Off Line Test switch should be in the On Line Test position.

3.3 Removing Power in an Emergency

Use the Unit Emergency Power switch on the tape control unit front cover or on the rear setup panel to remove subsystem power in emergencies, such as smoke coming from the unit, or liquids spilling into the tape control unit or any of the drives.

NOTE

Do not use the Unit Emergency power switch during normal operations.

If an emergency occurs, **move either of the Unit Emergency Power switches to the Power Off position** on the tape control unit.

Power is immediately removed from the subsystem.

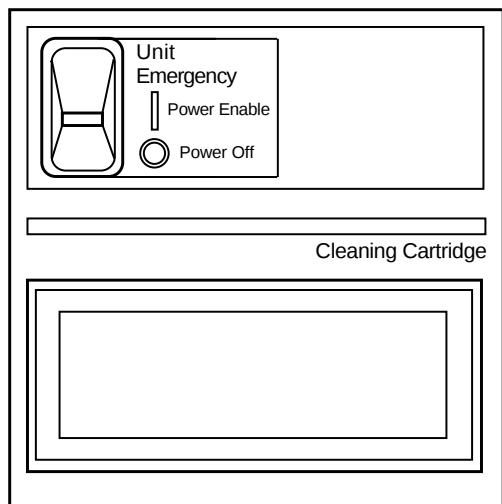


Figure 3-1 Unit Emergency Power Switch on Front Cover

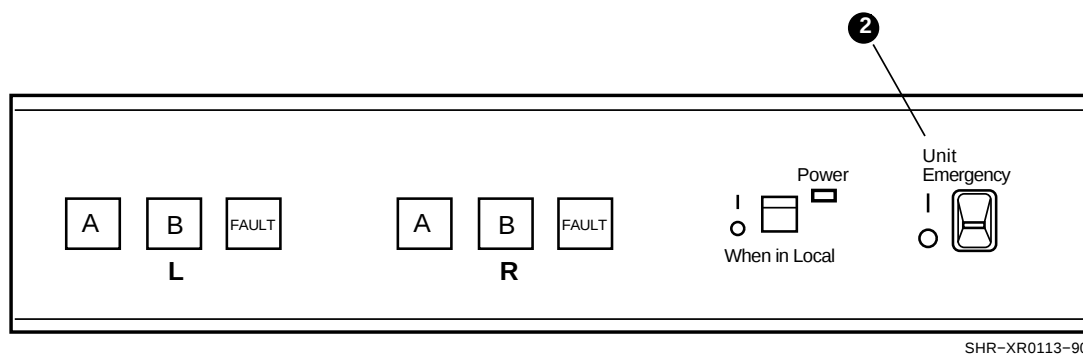


Figure 3-2 Unit Emergency Power Switch on Rear Setup Panel

3.4 Restoring Power After Emergency

After you use the Unit Emergency Power switch on either the front panel or the tape control unit setup panel to remove power from the subsystem, you must press the Local Power Enable pushbutton on the tape control unit setup panel before power can be restored to the subsystem.

1. Place the TCU On Line Test/Off Line Test switch ❸ in the On Line Test position.

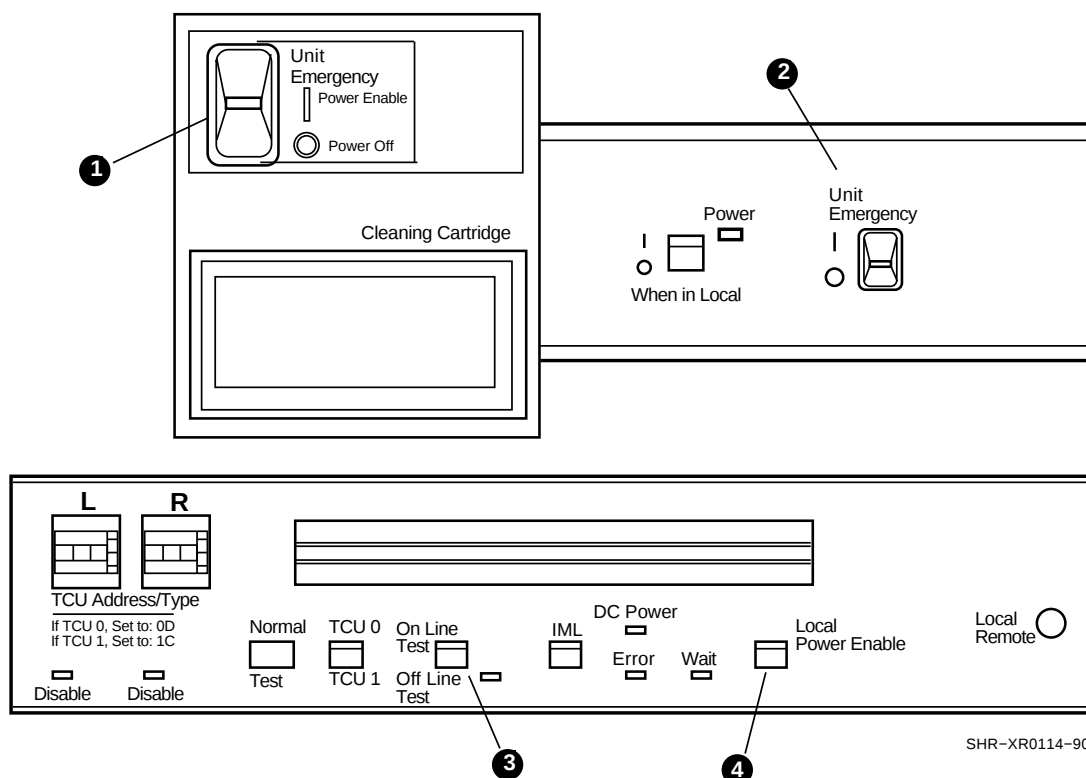


Figure 3-3 Restoring Power after an Emergency

2. Move either of the tape control unit's Unit Emergency Power switches ❶ or ❷ to the Power enable position.
3. Press the Local Power Enable pushbutton ❹ on the tape control unit operator setup panel.

The IML procedure starts automatically if the IML diskette is inserted into the diskette reader. If the diskette was removed from the diskette reader, see Section 3.2 for instructions to start the IML procedure.

NOTE:

Before proceeding, verify that the Wait light is on, otherwise, an error may occur.

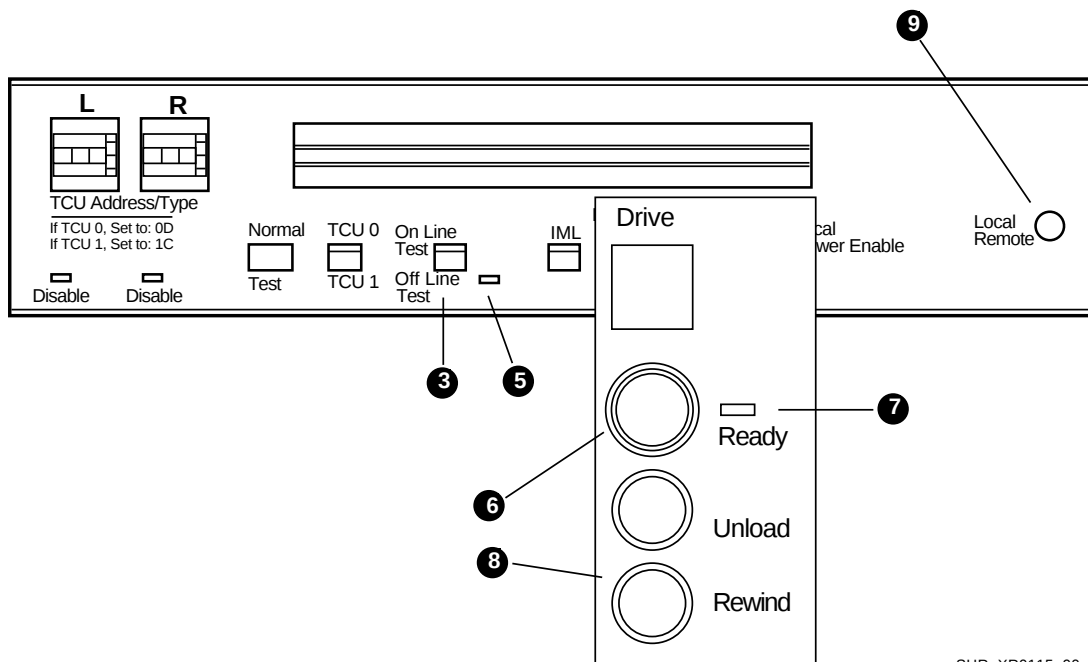
3-4 Operating Procedures

4. Press the Tape Drive operator panel Unload switches to remove all tape cartridges that were inserted in drives when the power went off.
5. Move the TCU On Line Test/Off Line Test switch ③ to the TCU On Line test position.

3.5 Removing Power During Normal Operations

To remove power from the subsystem:

1. Have all users dismount their tapes.
2. Place the tape control unit TCU On Line Test/Off Line Test switch **3** in the Off Line test position.



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Figure 3-4 Removing Power during Normal Operations

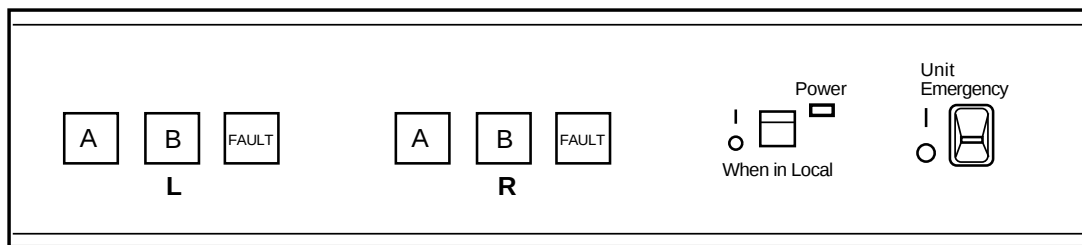
3. Wait for the TCU Off Line Test light **5** to come on.

Generally, the TCU Off Line Test light comes on within five seconds. However, if a job is running that consists of many read or write commands, the TCU Off Line Test light might not come on for up to five minutes.

If the TCU Off Line Test light did not come on within five minutes, the activity may be caused by something outside of the subsystem's control. Stop trying to get the tape control unit off-line and notify your system operator or supervisor.

4. Rewind and unload all the cartridges currently loaded in drives attached to the tape control unit.

- a. Set the Ready switches ⑥ on all drives to their not ready states and wait for the ready light(s) ⑦ to go off.



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Figure 3-5 Removing Power during Normal Operations

- b. Press the Unload switches ⑧. Wait for all cartridges to be unloaded.
5. If the Remote/Local switch ⑨ on the tape control unit operator setup panel is in the Remote position, move the switch to the Local position and continue with the next step.
6. On the tape control unit A/B Fault panel, place the Power On/Off switch in the Off position.

The Power On light goes off immediately.

3.6 Restoring Power During Normal Operations

1. On the tape control unit setup panel, make sure that the TCU On Line Test/Off Line Test switch is in the On Line Test position.
2. Place the Power On/Off switch in the On position ⑩.

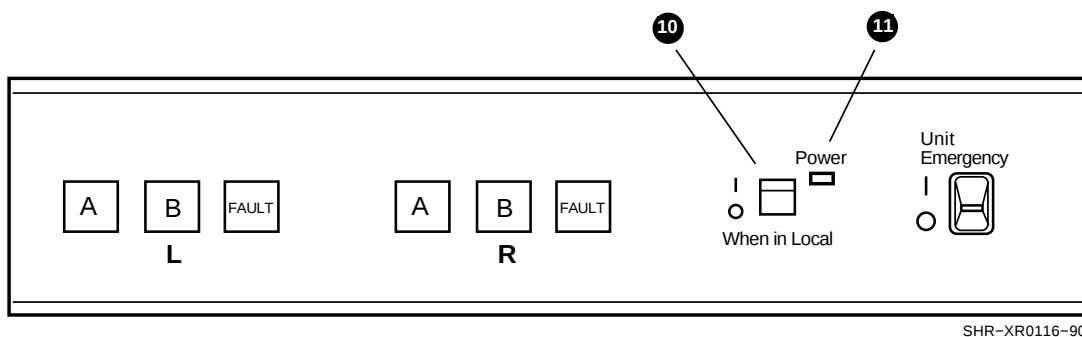


Figure 3-6 Restoring Power during Normal Operations

3. The Power On light ⑪ comes on when power is restored.

If the IML diskette is in place in the diskette reader, the IML procedure starts automatically. If the IML diskette is not in place when power is restored, refer to Loading the Microprogram into the Tape Control Unit in this chapter for instructions.

- If you usually operate with the Remote/Local switch on the tape control unit operator setup panel in the Remote position, place the switch in the Remote position now and resume operation.
- If you usually operate with the switch in the Local position, you may immediately resume operation.

3.7 Inserting Tape Cartridges and Starting Operations with the Cartridge Loader

The procedure for inserting tape cartridges and starting operations on the loader is divided into four sections:

1. Inspecting tape cartridges
2. Setting the file-protect selector
3. Inserting tape cartridges
4. Starting operations

Perform the following procedure before you begin inserting tape cartridges in the automatic cartridge loader.

3.7.1 Inspecting Tape Cartridges

1. Inspect the cartridge for damage *before* inserting it in the drive.

A damaged cartridge may not permit the tape to be threaded correctly and could cause damage to the drive.

A cartridge should be taken out of service if:

- The tape was wound completely out of the cartridge onto the machine reel and was then reattached to the cartridge reel by the service representative. This repair is temporary and permits the cartridge to be loaded one time so that the data can be copied to a replacement cartridge.
 - The cartridge case is cracked or broken.
 - The leader block is broken.
 - The leader block latch is broken.
 - The File-Protect selector is damaged.
 - The cartridge case contains any liquid.
 - The cartridge has any other obvious damage.
2. If you have a damaged cartridge, substitute a back-up version of the data from another cartridge.
 3. If the cartridge has a detached leader block but no other damage, you can repair the cartridge by using the materials in the Leader Block Repair kit. See Leader Block Detaches from Tape in Chapter 5 for information about the repair kit.

3.7.2 Setting the File-Protect Selector

A thumbwheel selector on the side of the cartridge can be set to one of two positions by rolling the thumbwheel to the left or right.

When the selector is in the File-Protect position, a white dot on the flat surface of the selector shows. This symbol means that the cartridge is file protected and can be used only for reading data.

When the selector is in the unprotected position, the rounded surface of the selector is visible and no symbol shows. This means the cartridge can be used for reading, writing, and erasing data.

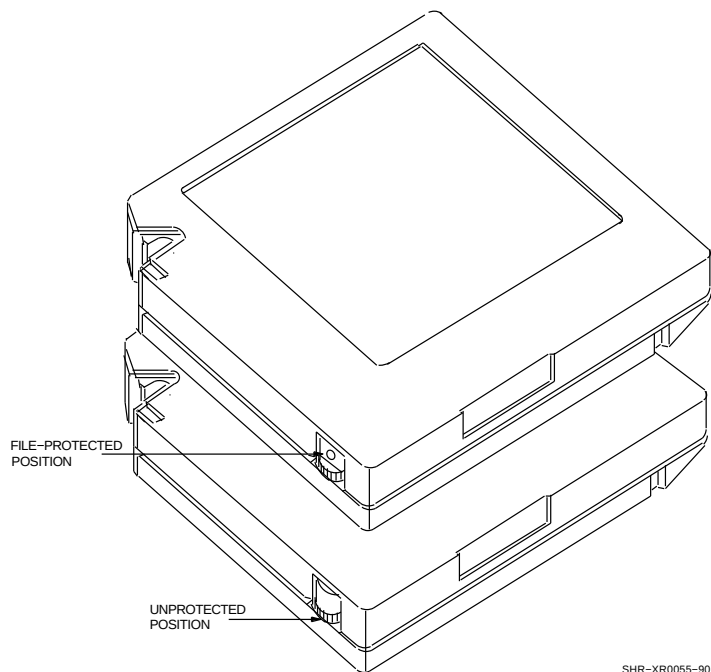


Figure 3-7 File-Protect Selector Position

NOTE

Any cartridge that is in the drive and is not file protected can be overwritten.

3.7.3 Inserting Tape Cartridges

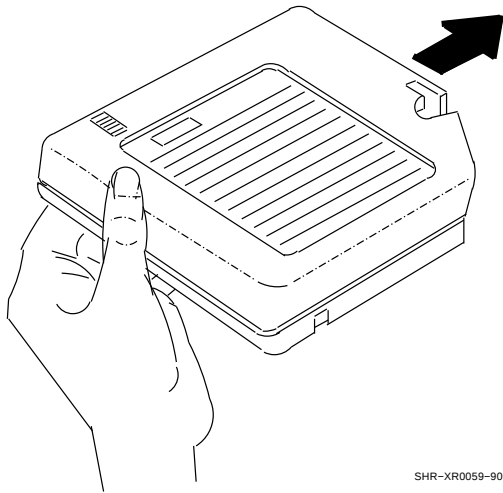
The cartridges are placed in the loader sequentially, from the bottom of the input stack to the top. The lowest cartridge slot on the input stack is called the feed position. Cartridges should not be placed in the feed position except for specific volume requests. This prevents the following problem:

- An operator error occurs if you place a cartridge in the feed position when another cartridge is already loaded on the drive. However, the error will not be detected until the drive attempts to unload the cartridge.
- If the next system request is for a volume other than the volume mounted, you have to remove the cartridge you just placed in the feed position.

NOTE:

A cartridge placed in the feed position will automatically be loaded into the drive and the drive is enabled. The Start switch does not need to be pressed.

For most efficient operation, place the cartridges in the input stack in adjacent slots, just above the feed position.



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Figure 3-8 Tape Cartridge (Loading Position)

1. Insert the cartridges when the indexing mechanism is not moving, such as when a tape is being processed, or when the loader is in the Manual mode.
2. Hold the cartridge with the smooth side up and with the leader block facing the drive.
3. When inserting a cartridge in the input stack, in a slot other than the feed position, line the cartridge up with a slot on the input stack and slide the cartridge in until it stops.

4. If you are inserting a cartridge in the feed position, line the cartridge up with the feed position, and slide the cartridge in until you feel and hear the loader's tractor assemblies engage and lightly hold the cartridge.

Cartridges placed incorrectly into the loader do not successfully load, and require operator attention to correct.

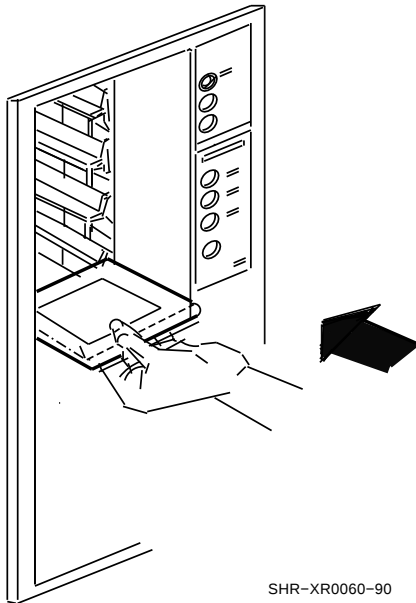


Figure 3-9 Cartridge Loader (Load Position)

3.7.4 Starting Operations

1. Select and press the mode selection switch for the desired operating mode.
For a description of the operating modes, see Section 2.4.2.
2. Press the Start switch ❶ on the loader operator panel.

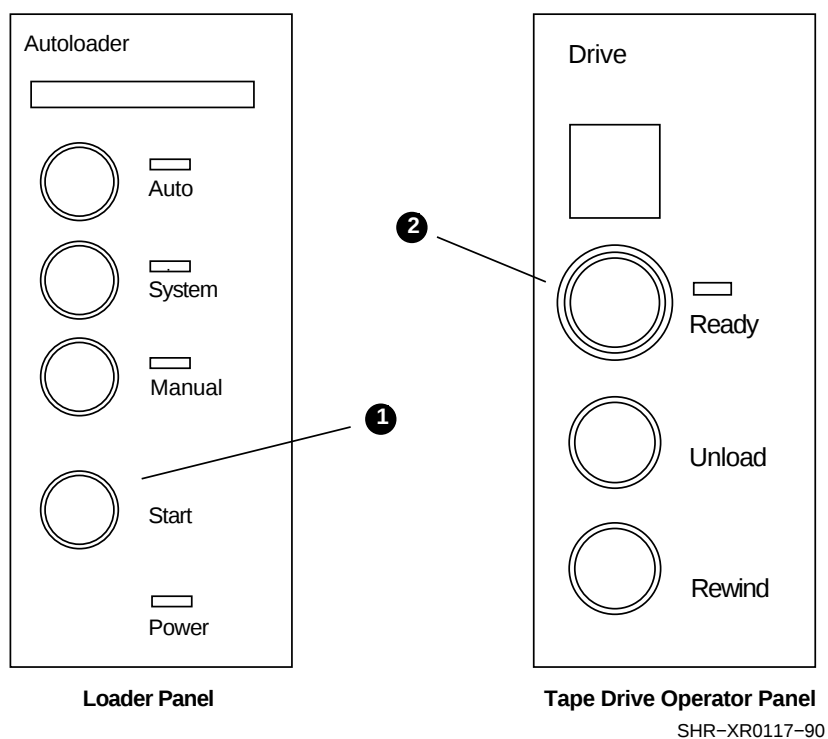


Figure 3-10 Cartridge Loader (Setting Switches)

3. Press the Ready switch ❷ on the drive operator panel to the ready position and wait for the light to go on.

The message display shows the drive condition when the cartridge is loaded. It also shows whether the cartridge is file protected (F) or unprotected (U).

NOTE
This message can be overwritten by other messages.

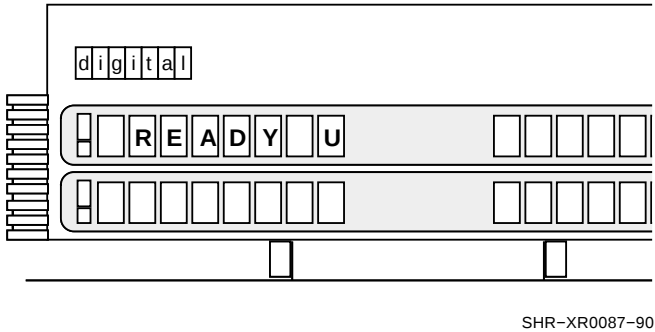


Figure 3-11 Cartridge Loader (Messages)

The loader cannot function automatically when the input stack is empty and the last processed cartridge has unloaded from the drive. The first indication of an empty input stack is the visibly empty input stack itself. In a VMS operating system, the next DISMOUNT/MOUNT request causes a blinking MOUNT message, a flashing attention light on the drive display, and a flashing Attention light on the loader, indicating that operator attention is required.

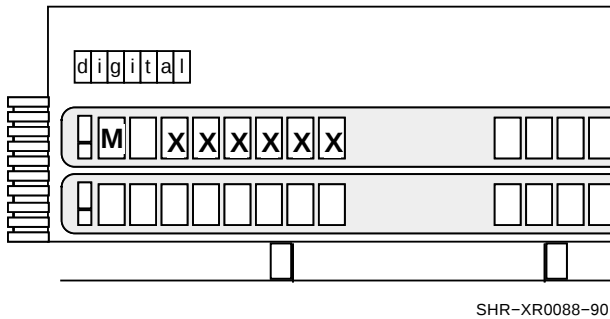


Figure 3-12 Cartridge Loader (Messages)

3.8 Removing Tape Cartridges from the Cartridge Loader

Remove tape cartridges when the indexing mechanism is not moving, such as when a cartridge is being processed, when all activity on the loader has stopped, or when the loader is in manual mode.

If you need to remove a tape cartridge that, for some reason, has not unloaded from the drive, refer to Unloading and Removing Tape Cartridges in this chapter. If you are removing tape cartridges that are not loaded on the drive, continue with the following procedure.

3.8.1 Removing a Single Tape Cartridge

Remove a single cartridge from the input stack (including the feed position) by pulling it toward you.

If the loader's tractor assembly is engaged and holding a cartridge in the feed position, you may feel some resistance when you pull on the cartridge. Continue to pull the cartridge toward you until you overcome the resistance and remove the cartridge.

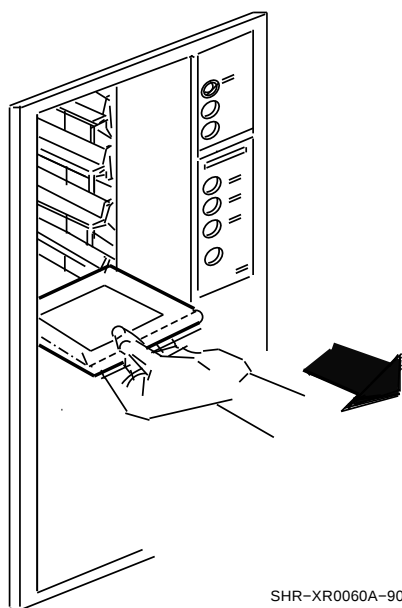


Figure 3-13 Cartridge Loader (Remove Single Cartridge)

3.8.2 Removing Multiple Tape Cartridges

Remove multiple cartridges from the output stack by placing one hand below the stack and one hand on top of the stack to keep it steady. Pull the stack of cartridges toward you. Cartridges in the middle of the stack may slip out. Avoid carrying stacks of cartridges for long distances.

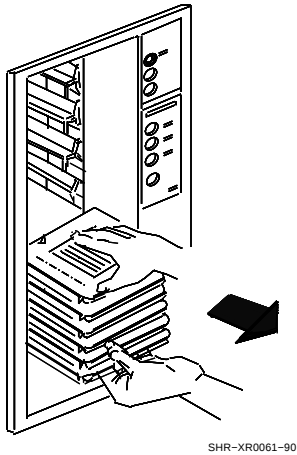


Figure 3-14 Cartridge Loader (Removing Multiple Cartridges)

3.8.3 Unloading and Removing Tape Cartridges

Sometimes, you may need to unload the tape before you can remove the cartridge. In those instances, issue an UNLOAD command from the host system. If the UNLOAD command does not successfully unload the cartridge from the drive:

1. Place the Ready switch ❶ to the not ready position and wait for the ready light to go off.
2. Press the Unload switch ❷.

WARNING

Pressing the Unload switch when the tape has not been rewound can cause a job to abort.

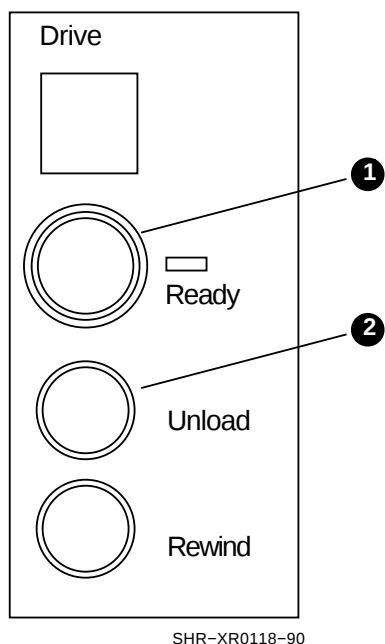


Figure 3-15 Cartridge Loader Operator Panel Switches

The message display shows the drive condition while the rewind-and-unload operation is in progress. When the rewind-and-unload operation is complete, the message display shows an asterisk (*).

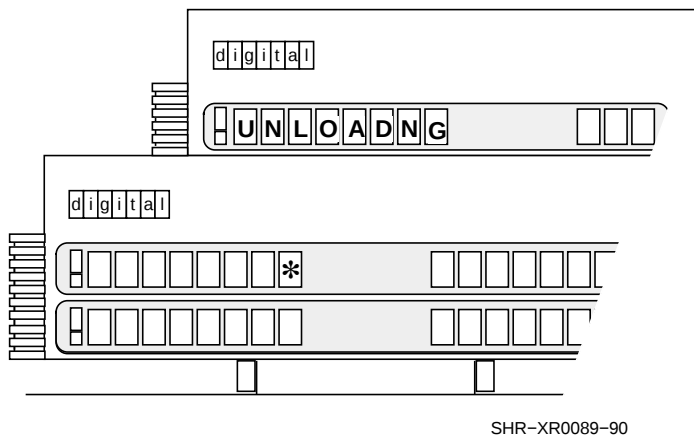


Figure 3-16 Cartridge Loader (Messages)

3. When the loader has placed the cartridge in the feed position or the output stack, remove the cartridge by pulling it toward you.

3.8.4 Rewinding a Tape

During normal operations, the drive automatically rewinds and unloads the tape when a job completes. However, there may be times when you need to rewind the tape but not unload it. To do this:

1. Press the Ready switch ❸ to the not ready position and wait for the ready light ❹ to go off.
2. Press the Rewind switch ❺.

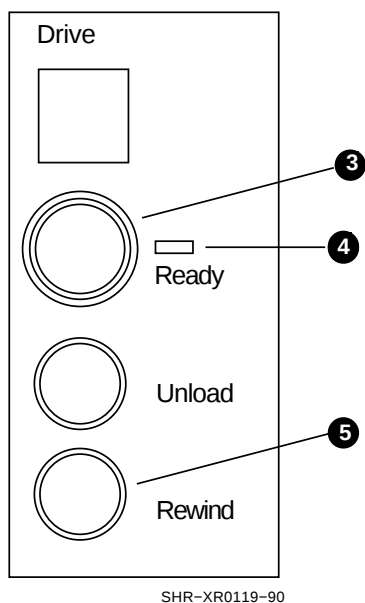
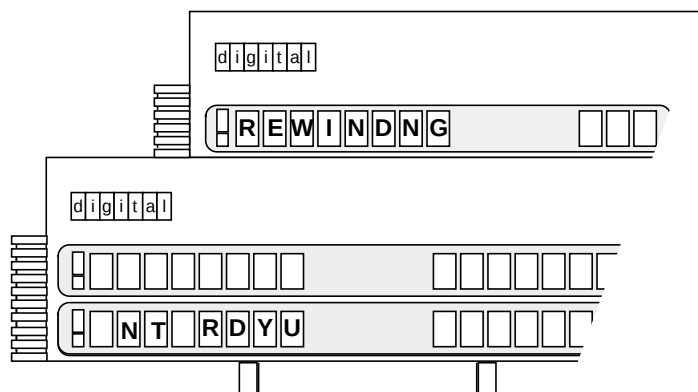


Figure 3-17 Switches Used for Rewinding a Tape

The message display shows the drive condition while the rewind operation is in progress and after the tape is rewound. For example: NT RDY U is displayed when the drive is not ready and an unprotected cartridge is inserted.



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Figure 3-18 Rewinding Tape Message

3. Press the Ready switch ③ to the ready position and wait for the ready light ④ to come on.

The message display shows the drive condition when the drive is ready. It also shows whether the tape is file protected (F) or unprotected (U).

NOTE

This message can be overwritten by other messages.

3.9 Using Auto/Manual Modes on the Cartridge Loader

The loader has an operator panel which allows the operator to select and change modes as desired.

3.9.1 Using Auto Mode

1. Press the Auto mode selection switch ❶.

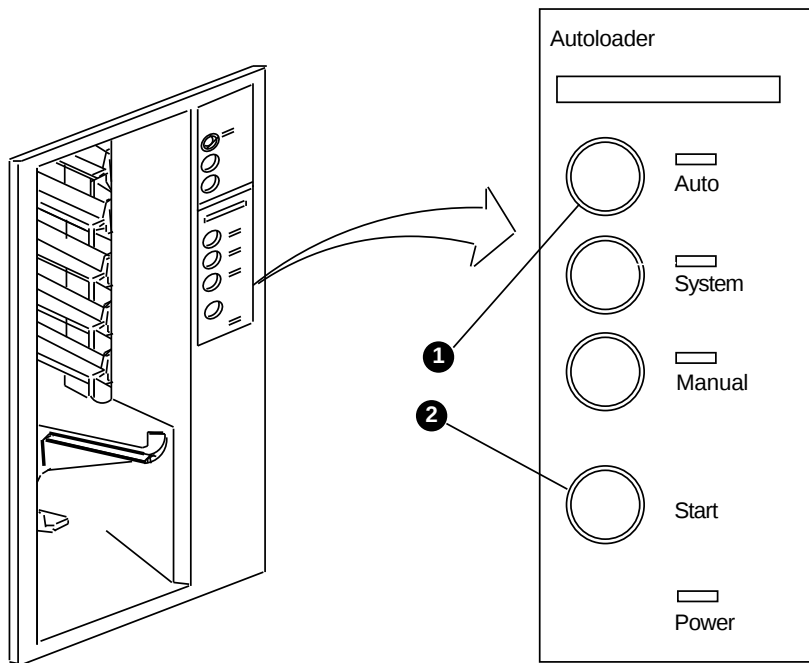
NOTE

If the input stack is empty in Auto mode, the Attention light on the loader panel flashes.

2. Place one to six cartridges in the input stack.

NOTES:

- a. **If a cartridge is already loaded, do not place another cartridge in the feed position of the input stack. If a cartridge in the drive attempts to unload when a cartridge is present in the feed position of the loader, the Attention light on the loader flashes to indicate a problem.**
- b. **A cartridge placed in the feed position is automatically loaded into the drive without the necessity to press the Start switch.**



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Figure 3-19 Cartridge Loader (Auto Mode)

3. Press the Start switch ❷.

The loader feeds and loads the cartridge, and waits for a request from the system.

NOTE

When you switch from Manual mode to Auto mode, you must press the Start switch to start automatic operation of the loader.

As long as the input stack is refilled before the last tape is unloaded, and the output stack is not allowed to completely fill, the cartridges continue to feed and load without any other actions.

When the input stack is empty, and the last tape cartridge has been unloaded from the drive, operation stops.

If the input stack becomes empty:

1. Place one or more cartridges in the input stack.
2. Press the Start switch to restart automatic operations.

If the output stack completely fills:

- The Attention light on the loader flashes.
- Loader operations stop. If a seventh cartridge is indexed to the feed position of the loader as the sixth cartridge is indexed to the output stack, the seventh cartridge is processed and returned to the feed position.

Do the following:

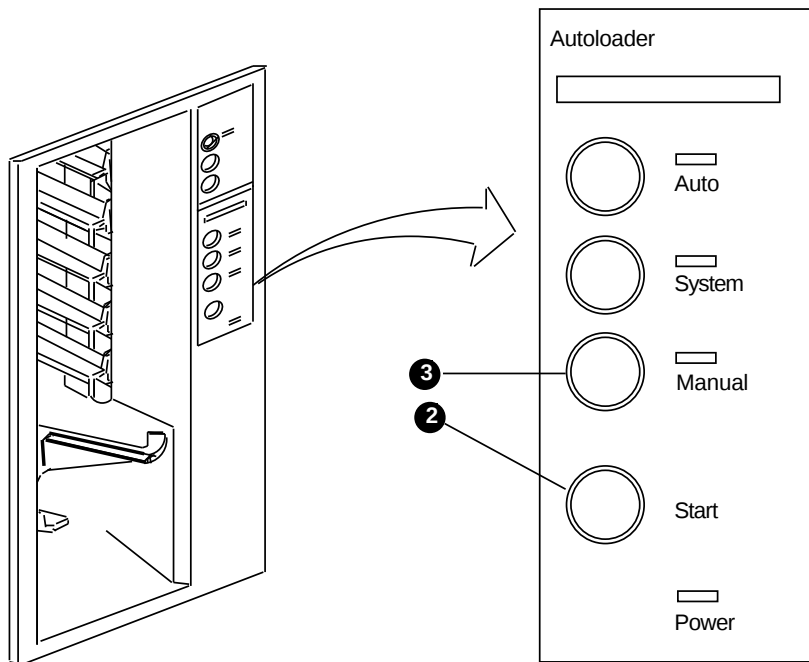
1. Remove one or more cartridges from the feed position and/or output stack.
2. Press the Start switch to restart automatic operations.

3.9.2 Using Manual Mode

1. Press the Manual mode selection switch ③.
2. When a MOUNT message appears on the drive display or system console, place the requested volume in the input stack.

The feed position (the lowest position on the input stack) saves time because the loader does not have to index. If cartridges that you do not currently want to use are premounted in the input stack, placing a cartridge in the feed position prevents them from being indexed and loaded.

If you do not place a cartridge in the feed position, the first available cartridge in the input stack is indexed and loaded when you press the Start switch.



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Figure 3-20 Cartridge Loader (Manual Mode)

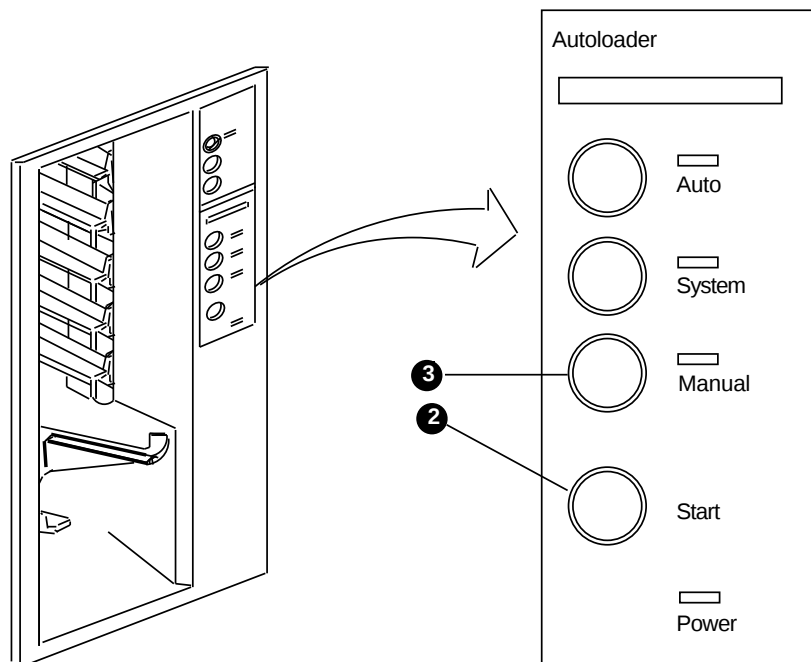
3. Press the Start switch ②, unless a cartridge was placed in the feed position.

When a cartridge unloads, it remains in the feed position until it is removed manually. If you want to reuse the same cartridge for the next MOUNT request on that drive, you must remove and reinsert the cartridge.

3.9.2.1 Raising an Empty Output Tray in Manual Mode

To raise an empty output tray without having to load a cartridge, do the following:

1. Make sure no cartridge is loaded or in the feed position.
2. Press the Manual mode ③ selection switch.
3. Place a cartridge in the input stack, but not in the feed position.
4. Press the Start switch ②.
5. When the output tray begins to rise, remove the cartridge from the input stack before it loads.



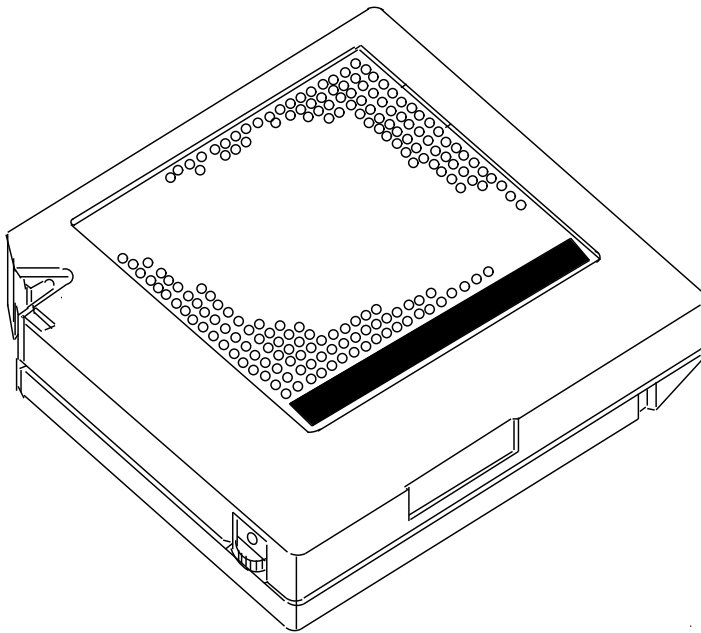
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Figure 3-21 Cartridge Loader (Manual Mode)

3.10 Cleaning Procedures

The tape path must be kept clean to prevent errors caused by contamination. A cleaning cartridge is shipped with each tape control unit. We recommend that the cleaning cartridge be replaced after 500 uses. You can keep track of the number of uses by marking the label provided with each cartridge. Do not use a china-marking (grease) pencil on the label.

The cleaning cartridge should be undamaged and clean when it is inserted into a tape drive.



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Figure 3-22 Cleaning Cartridge

3.10.1 Cleaning the Tape Path

The tape path on each drive should be cleaned at least once every seven days. Processing an unusually large amount of tape requires cleaning every 8 hours. The drive displays a *CLEAN message after a predetermined amount of tape has processed. If you see this message, clean the drive tape path as soon as possible. However, you should clean the tape path once each shift regardless of whether a *CLEAN message is displayed.

The drive usage status, and the cleaning process, are drive-only functions. They are unknown to the TA91 tape control unit and system processor. Therefore, information about drive usage can be lost during maintenance or reconfiguration. In addition to the regular weekly cleaning cycle and *CLEAN message requirements, the drives should be cleaned before returning them to service after any of the following reset conditions occur:

- Drive power on: clean the drive that was powered on.
- Tape control unit power on—clean all the drives that are powered by the tape control unit that was powered on.

- Drive maintenance or checkout procedures: clean the drive that was serviced.

To clean the Tape Path:

1. Insert the cleaning cartridge the same was as a normal tape.

NOTE:

The cleaning cartridge should be undamaged and clean when it is inserted into a tape drive.

Put the cartridge in the feed position (the cartridge will be loaded automatically into the drive). It is **not** necessary to move the Mode switch or press the Start switch. The cleaning cartridge can be put in the input stack, and the cleaning procedure will take place whenever the cleaning cartridge is loaded into the drive. The cleaning procedure has no effect on a job that is processing on the drive.

The drive threads the cleaning tape and then rewinds and unloads it when the cleaning procedure completes.

2. When the cartridge has completed the unloading procedure, remove it.

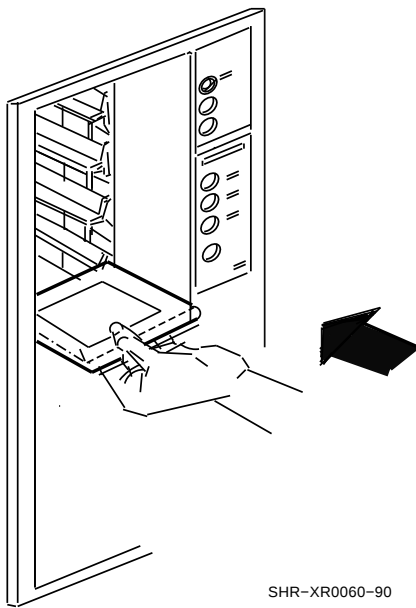


Figure 3-23 Loading the Cleaning Cartridge

3.11 Cleaning a Tape Cartridge

Inspect the cartridge for damage or dirt before inserting it into the drive. damaged or dirty cartridges can reduce subsystem reliability and cause data loss. If dirt appears on the cartridge, wipe the outside surfaces with a lint-free cloth that has been lightly moistened with DIGITAL cleaning fluid (PN TUC01).

WARNING

Do not allow anything wet, including cleaning fluid, to contact the tape.

Make sure all cartridge surfaces are dry and the leader block is snapped into place before loading the cartridge.

Care and Handling of the Magnetic Tape Cartridge

4.1 Cartridge Description and Handling

The tape cartridge (PN 30-29907-01) consists of one reel of 12.65 millimeter magnetic tape in a cartridge case.

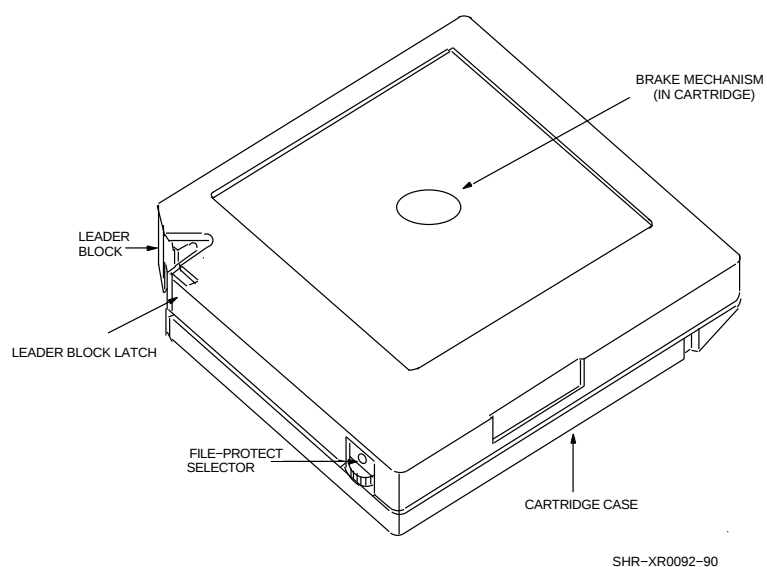


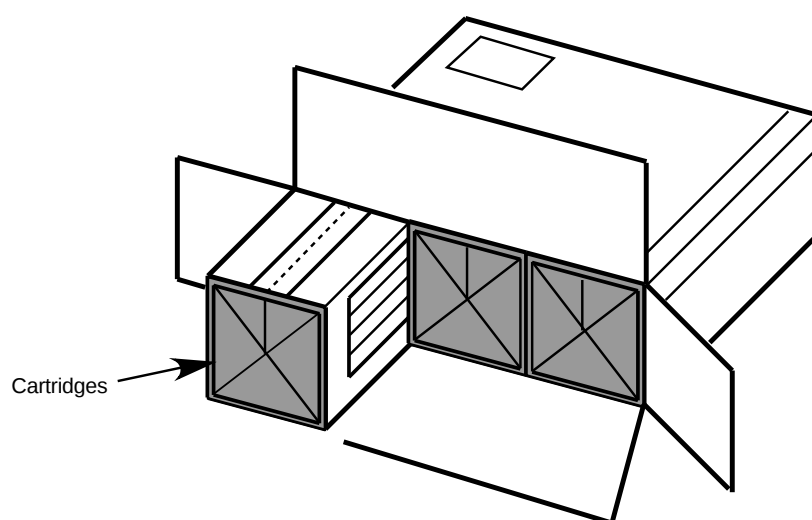
Figure 4-1 Magnetic Tape Cartridge

4-2 Care and Handling of the Magnetic Tape Cartridge

Each cartridge consists of a:

- Reel of magnetic tape
- Cartridge case with a leader block latch
- Leader block
- File-protect selector
- A brake mechanism

Cartridges are shipped in cartons. Every carton of cartridges contains 30 cartridges packed in 3 rows of 10. Each row of ten cartridges within the carton is sealed in plastic to protect the cartridges from contamination during shipment. The plastic wrap is provided with a tear string for easy opening.



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Figure 4-2 Tape Cartridge Packaging

4.2 Tape Media Requirements

All of DIGITAL's tape drive products are designed and manufactured for high performance and reliability. The considerations that are given to produce such products must include the tape media that is to be used on them.

DIGITAL is constantly evaluating tape media in an ongoing effort to ensure a high quality product. To date, there are no back-coated magnetic tapes that meet DIGITAL's specification. Back-coating has been found to cause such problems as tape slippage, load failures, false End Of Tape (EOT) and Beginning Of Tape (BOT) sensing and more frequent drive cleaning due to the residue left on the tape drive by the back coating. As a result of these problems, back-coated magnetic tapes are not recommended for use on the TA9X family of tape drives.

4.3 Unpacking and Handling

Incorrect handling, or an incorrect environment, can damage the magnetic tape or the cartridges. See Section 4.6 for information.

To avoid damage to your tape cartridge, and to ensure continued subsystem reliability:

- Leave the cartridges in their protective wrapping until you use them. When unpacking new cartridges, remove the protective wrapping in your computer room. Use the tear-string to remove the protective wrapping (do not use a sharp instrument).
- Inspect each cartridge to ensure that the leader block is correctly latched. If not, push the leader block toward the cartridge until it catches in the latch.
- Before using the cartridges, condition them to the normal operating environment for at least 24 hours. See the Operating Environment section in this chapter.
- When loading a cartridge into the tape drive, or when handling a cartridge, be sure that the cartridge case is not dirty. Dirty tape cartridges can cause cartridge loading problems or data loss. If a cartridge case is dirty, follow the instructions in the Cleaning Procedures section in this chapter.
- Do not carry cartridges loosely in a box or basket. The leader blocks can catch on other cartridges and unlatch. If the leader block is not correctly latched into the cartridge, loading errors can occur.
- **Do not load a damaged tape cartridge into a tape drive.** Damaged cartridges can interfere with the reliability of your subsystem. (For specific information about damaged cartridges, see the Damaged Cartridges section in this chapter.) If a cartridge is dropped, inspect it for damage before using it.
- Do not pull tape from the cartridge after releasing the leader block. Opening the cartridge can damage the tape leader block and the tape attachment, thus causing load failures. See the Damaged Cartridges section in this chapter.
- Do not handle tape that is outside the cartridge. Handling the tape can damage the tape surface or tape edges, which might interfere with the read or write reliability. Pulling on tape that is outside of the cartridge can damage the tape and brake mechanism.
- Do not expose the tape cartridge to moisture or direct sunlight.
- Do not expose recorded cartridges to stray magnetic fields, such as those existing near high-current cables or power supplies. Such exposure can cause the loss of recorded data.
- Do not expose unrecorded cartridges to stray magnetic fields such as those existing near dc motors or ac generators. Exposure to such magnetic fields can degrade tape performance.

NOTE

AC erasing all the magnetic records from the tape (degaussing) for security purposes will not damage the tape.

- Maintain the conditions described in the Storage Environment section in this chapter for all cartridges stored outside your operating environment.

4.4 Cartridge Labels

Recesses are provided in the cartridge surface for attaching labels.

There are two kinds of cartridge labels: a customer label, and a volume/serial number label. Attach the customer label to the top surface of the cartridge; attach the volume/serial number label to the side opposite the file-protect selector as shown in Figure 4-3. Place the labels in the recessed cartridge label areas only.

NOTE

Labels that extend outside of the recess areas can cause loading problems in the drive, particularly when using an cartridge loader.

When using cartridge labels, make sure to:

- Use peel-clean labels that do not leave a residue after they are removed.
- Always remove the old label before applying a new label. Do not erase information from labels on the cartridges.
- Write information on the labels with markers that will not smear or leave a residue on the cartridge. Do not use china marking pencils.

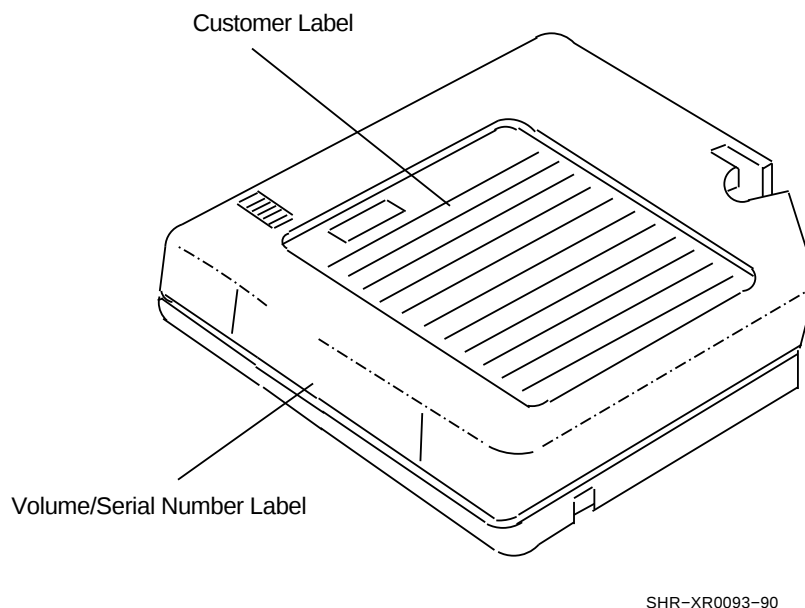


Figure 4-3 Cartridge Label Locations

4.5 Stacking Cartridges

Cartridges are shipped vertically and should be stored with the reel in the vertical position, but, you can lay the cartridges flat while moving them. The bottom of each cartridge has two raised areas that fit into the indented label area on the top of another cartridge. This helps prevent the cartridges from sliding.

Do not stack more than six cartridges. See the Storage Environment section in this chapter.

4.6 Damaged Cartridges

The cost of a tape cartridge is low compared to the cost of damage to tape drives and possible loss of recorded data. Therefore, check the cartridge for damage before using it in the tape drive. A good practice is to copy essential records and keep them in a secure storage area.

To ensure continued use of your cartridges and subsystem:

- **Do not attempt to open the cartridge case at any time.** The upper and lower parts of the case are welded. Separating them destroys the usefulness of the cartridge.
- **Do not load a damaged cartridge into a tape drive.** During an emergency, if you need to recover data from a damaged cartridge, call your service representative.

The damage that can occur to a cartridge includes (Figure 4-4):

- The cartridge case is cracked or broken.
- The leader block latch is broken.
- The leader block is broken.
- The tape has become detached from the leader block.
- The braking mechanism is jammed or broken.
- The file-protect selector is damaged.
- The cartridge case contains any liquid.
- The tape was wound completely out of the cartridge onto the machine reel and then reattached to the cartridge reel by the service representative. This repair is temporary and permits the cartridge to be loaded one time so that the data can be copied to a replacement cartridge.
- The cartridge has any other obvious damage.

4.7 Tape Cartridge Environment

The environment includes all aspects of the operating and storage environment that can affect the magnetic tape cartridge.

4.7.1 Operating Environment

The ambient operating environment for the drives using the tape cartridge should be:

- 15.6°C to 32.2°C (60°F to 90°F) dry bulb
- 20 to 80 percent relative humidity
- 25.6°C (78°F) maximum wet bulb.

NOTE

Before using a cartridge, condition it to the operating environment for a time equal to, or greater than, the time it was out of the operating environment. If the cartridge has been out of the operating environment for more than 24 hours, condition it only up to 24 hours.

4.7.2 Storage Environment

The original shipping container is the best storage container for the cartridges until it is opened because the plastic wrapping prevents contamination and partially protects them from humidity changes.

Cartridges can be stored within the following temperature and humidity ranges:

- 4.4°C to 32.2°C (40°F to 90°F) dry bulb
- 5 to 80 percent relative humidity
- 26.7°C (80°F) maximum wet bulb.

NOTE

Digital Equipment Corporation does not recommend continuous, extended storage of the tape cartridges in the maximum temperature and humidity environment. However, if necessary, you can store the cartridges in the maximum-condition environment for up to four weeks without damaging the data or the cartridge.

4.8 Cartridge Disposal

Disposing of the magnetic tape cartridge is a regulated procedure, governed by the rules of the Environmental Protection Agency (EPA), regulation 40CFR261. The TA91 tape cartridge is currently classified as nonhazardous waste and, as such, it may be disposed of in the same way as normal office trash. (These regulations are amended from time to time and should be reviewed at the time of disposal.)

If your local, state, or country (non-U.S.A.) regulations are more restrictive than EPA 40CFR261, they must be reviewed before cartridge disposal. You may contact your account representative for information about the materials that are in the cartridge assembly.

4.9 Data Security

Data security issues are an important aspect of magnetic tape management, and include:

- Erasing
- Burning
- Shredding

4.9.1 Erasing

The data on cartridges can be erased using a high-energy (a minimum of 1200 oersted peak field over the entire space to be occupied by the cartridge) ac degausser. This will not harm the cartridge or tape and the cartridge can be reused.

The data on the tape can be entirely erased by heating the cartridge and tape to a temperature above the Curie temperature (the temperature at which the magnetic particles in the tape lose their magnetic characteristics).

For DIGITAL tape, the Curie temperature is 125°C (257°F). For effective data erasure, the tape should be heated to 130°C (266°F). **Cartridges heated to this temperature are not reusable.**

4.9.2 Burning

Comply with all applicable incineration regulations when burning cartridges and/or the tape.

4.9.3 Shredding

DIGITAL recommends that you do not shred the cartridge or tape. If you do, make sure that the process used for shredding and disposal complies with all regulations.

5

What to Do if You Have a Problem

This chapter identifies some of the problems that can occur while using the TA91 subsystem. Possible solutions are suggested after each problem. If a **CHK XY** message is displayed, record the **XY** number and refer to the Check Code Table in Appendix B and follow the instructions in the Action Required column.

Table 5–1 Problems? Quick Look Up Guide

Problem	Refer to
Cartridge Loading	Section 5.1, You Can't Insert a Cartridge Section 5.10, There is a Check Code Message on the Message Display Section 5.4, A Drive Does Not Become Ready Section 5.9, Leader Block Detaches from Tape Section 5.6, Tape Winds Completely Out of Cartridge
Cartridge Unloading	Section 5.11, You Want to Unload a Cartridge after a Power Failure Section 5.9, Leader Block Detaches from Tape Section 5.5, Tape Does Not Rewind or Unload Section 5.3, IML Procedure Fails
IML Procedure	Section 5.3, IML Procedure Fails
Message Display	Section 5.10, There is a Check Code Message on the Message Display Section 5.4, A Drive Does Not Become Ready Section 5.2, Message Display is Blank Section 5.3, IML Procedure Fails
Cartridge Loader	Section 5.7.1, Attention Indicator is Flashing Section 5.7.2, Attention Indicator is On Continuously (Not Flashing) Section 5.8, You See a Message Code on the Message Display

5.1 You Can't Insert a Cartridge

If the cartridge will not load:

- Inspect the cartridge for damage. See Section 3.7.3, and Chapter 4 for more information on cartridge handling.
- Try to load another cartridge.
 1. If the new cartridge can be inserted, the original cartridge may be defective. Have your customer engineer inspect it for damage.
 2. If the cartridge is not damaged but cannot be inserted, call your customer engineer.

5.2 Message Display is Blank

If the message display is blank:

- Power may not be supplied to the tape control unit. Set the tape control unit Power On/Off switches to On.
- The main service power to the subsystem may not be on. Follow your system operating procedures for turning on the main power supply. See Section 3.6.
- If the message display is still blank, call your service representative.

5.3 IML Procedure Fails

If there is an error during the IML procedure and the Error light displays (instead of the Wait light):

- Set the On Line Test/Off Line Test switch to Off Line Test and press the IML pushbutton on the tape control unit operator set up panel. Immediately set the On Line Test/Off Line Test switch back to On Line Test.
- If the IML procedure still fails, call your customer engineer. Message displays may hold useful information which should be relayed to your customer engineer.

5.4 A Drive Does Not Become Ready

If the drive will not become ready:

- The Ready switch on the drive operator panel may not be in the ready position. Press the switch to the ready position; the Ready light should come on.
- The cartridge may not be inserted correctly. Remove the cartridge and insert it again. See Section 3.8 and Section 3.7.3.
- Record the check code, (if there is a check code message on the message display), press the Unload switch, and try the operation again.

If the drive still does not become ready, or if there is a check code message on the message display, record the code and contact your customer engineer.

5.5 Tape Does Not Rewind or Unload

If the tape will not rewind or unload:

- The Ready switch on the drive operator panel might be in the ready position. Press the switch to the not ready position; the Ready light should go off.
- If there is a check code message on the message display, record the check code, press the Unload switch, and try the operation again.

If the drive still does not rewind or unload, or if there is a check code message on the message display, record the code and contact your customer engineer.

5.6 Tape Winds Completely Out of Cartridge

If the tape winds out of the cartridge, call your customer engineer. If there is a check code message on the message display, record the code and report it to your customer engineer.

5.7 Cartridge Loader Recovery Procedure

There are two cartridge loader recovery procedures, one for loaders with flashing Attention indicators, and the other for loaders with continuous Attention indicators (not flashing). Perform the recovery procedure that is appropriate for your loader's condition.

5.7.1 Attention Indicator is Flashing

If the attention indicator is flashing:

- Remove the cartridge from the feed position (if present).
- Remove the cartridges from the output stack.
- Add cartridges to the input stack if the loader is in Auto mode.
- Press the Start switch to resume operation.

Further operator service may be required during the recovery situation if one of the following conditions occurred:

- A cartridge in the drive was returned to the feed position. Remove the cartridge and press the Start switch again to resume operation.
- In Manual mode, an attempt was made to load the same cartridge that was just processed. If the same cartridge is to be used again, remove and reinsert it. Press the Start switch to resume operations.

NOTE

The Attention indicator on the loader is turned off when the problem is corrected.

5.7.2 Attention Indicator is On Continuously (Not Flashing)

If the attention indicator remains on, an error may have occurred within the loader and the drive message display check code can aid in problem determination. See the Check Code Table in Appendix B. If the check code table refers to this section, or if no check code appears, continue with the following steps:

- Remove the cartridge from the feed position (if present).
- Remove the cartridges from the output stack.
- Initiate a manual recovery attempt by pressing the Unload switch on the TA91:
 - The recovery is successful if the attention indicator on the loader is turned off.
 - If the Attention indicator on the loader begins flashing, perform the actions listed in the Section 5.7.1.
- If the attention indicator on the loader remains on continuously after pressing the Unload switch three times, press the drive reset pushbutton and do the following:
 1. Deallocate the drive. This must be done from an operating system which currently has a path access to this device.

If the Attention indicator remains on continuously, proceed with the following steps.
 2. Dismount the drive.
 3. Allocate and mount the drive.

4. If a drive **CHK XY** error message appears on the drive's message display, go to the "Check Code Table" in Appendix B and perform the actions in the Action Required column.

If the Attention indicator remains continuously on after repeating the recovery procedure three times, call your customer engineer. If there is a check code message on the message display, record the code and report it to your customer engineer.

5.8 You See a Message Code on the Message Display

If you attempt to write on a tape that has its file-protect selector set to the file-protect position, automatic operation stops, the cartridge remains in the drive, and an error message is sent to the console and to the message display. By stopping automatic operation, the system cannot bypass any cartridge and you can maintain control of each cartridge. Pre-staged cartridges are kept in order.

You will have to go to both the console and the drive to recover from this error.

To recover:

1. Go to the drive and place the cartridge loader's mode switch in the Manual position. This will prevent the loader from lowering the cartridge from the feed position to the output stack and inserting the next cartridge from the input stack when Step 2 is performed.
2. If a tape is mounted, dismount and unload the tape.
3. Return to the drive.
 - a. Remove the cartridge from the feed position.
 - b. If the file-protect selector was incorrectly set, set it to the correct position. If the incorrect cartridge was mounted, replace it with the correct one.

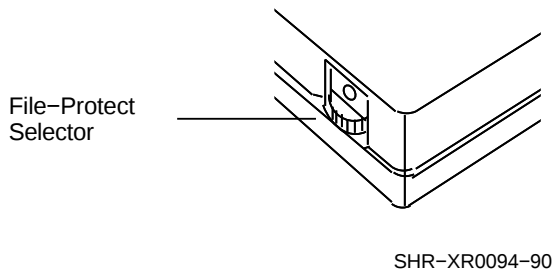


Figure 5-1 File-Protect Selector

- c. Put the original or replacement cartridge into the feed position in the loader.
- d. Reset the mode switch on the cartridge loader panel to the position it was in before Step 1.
- e. Press the Start switch.

Do not press the Ready or Unload switches when you unload the cartridge. If you do, you will cause an error on the drive. To recover from such an error:

1. Correct the original problem first and start the cartridge loader.
2. Go back to the console and mount the drive on-line.

This type of error can be avoided by making sure:

- The file-protect selector is set to write enable before putting writable cartridges in the loader.
- All cartridges have the correct label.

- Pre-staged cartridges are in the correct order.

5.9 Leader Block Detaches from Tape

- Replace the leader block on the tape by using the materials in the TA91 Leader Block Repair Kit. Contact your branch representative for information. The kit contains instructions for replacing the leader block.
- If the leader block did not come out of the drive when you removed the cartridge, do not use that drive because the leader block could be stuck in the threading mechanism. Report the problem to your customer engineer.

NOTE

Replacing the leader block is a temporary repair and lets you insert the cartridge one time so that the data can be copied to a replacement cartridge. After repairing the leader block and recovering the data, do not use the cartridge again. If the cartridge is within warranty, return it to Digital.

5.10 There is a Check Code Message on the Message Display

If there is a check code message on the message display, record the code, then go to the "Check Code Table" in Appendix B. The Check Code Table lists the check codes, their definitions, and the actions to take in response to those check codes.

The Action Required column of the Check Code Table may direct you to perform the check code recovery procedure or go to the Cartridge Loader Recovery Procedure section in Chapter 5, which is the recovery procedure for the Cartridge Loader. If there is a problem on the loader (the Attention Indicator on the loader is on or flashing), always perform the recovery actions for the loader before attempting recovery actions on the drive.

5.10.1 Check Code Recovery Procedure

- Try to get the drive to unload the cartridge. See Section 3.8.4 or Section 3.8.
 - Press the Ready switch to the not ready position; the ready light should go off.
 - Press the Unload switch.
- If the drive unloads the cartridge, then retry the operation.
- If the drive does not unload the cartridge, press the Unload switch again.
- If the drive still does not unload the cartridge:
 - If there is a check code message on the message display, record the code and save it for your customer engineer.
 - Press the Unload switch.
- If the drive unloads the cartridge, retry the operation.
- If the drive still does not unload the cartridge, record the check code, if displayed, and call your customer engineer.

5.11 You Want to Unload a Cartridge after a Power Failure

- Use the appropriate procedure for restoring power (see Section 3.4, or Section 3.6).
- Press the drive Unload switch.

Standard VMS System Commands

A.1 VMS Commands Used with TA91

The TA91 uses all the standard magnetic tape commands that can be invoked by your operating system. This section outlines some of the major commands by which the VMS operating system accesses the TA91.

If you are using an operating system other than VMS, use the same commands for the TA91 that you normally use for any magnetic tape device. See the reference documentation supplied with your system.

The following command descriptions are written assuming the TA91 tape cartridge is already in the drive and the TA91 is called MUA0 by the system. These commands have several qualifiers and options. For more detailed information on these commands, refer to your operating system manuals.

A.1.1 ALLOCATE

ALLOCATE provides exclusive access to a device (such as the TA91) and optionally establishes a logical name for that device. Once you have allocated a device, other users cannot access that device until you explicitly DEALLOCATE it, or until you log out. Use the following format to allocate the TA91.

```
ALLOCATE MUA0: [logical name]
```

Example: To allocate the TA91 for your use and assign it the logical name TAPE1, type the following.

```
$ ALLOCATE MUA0: TAPE1:
```

A.1.2 INITIALIZE

CAUTION

Make sure that the tape is blank before initializing.

INITIALIZE writes directory information and file structure, specifies the device name (MUA0 or TAPE1), and writes a volume name to the magnetic tape volume on the TA91. The tape must not be write protected for the initialize operation. The command has the following format.

INITIALIZE logical name: [volume name]

Example: To initialize the device called TAPE1 and assign the volume name GMB001, type the following.

```
$ INITIALIZE TAPE1: GMB001
```

While the tape volume is being initialized, the select light blinks. When the initialize is complete, the tape rewinds and then the select light stays off and "B.O.T. U." is shown in the display.

For detailed information regarding volume names and magnetic tape operations, refer to the *Guide to VAX/VMS Disk and Magnetic Tape Operations* (AI-Y506B-TE).

A.1.3 MOUNT

MOUNT lets you make a magnetic tape volume available for processing. With the TA91, MOUNT takes the following format.

MOUNT/FOREIGN/CACHE=TAPE logical name: volume name

Example: To make GMB001 on TAPE1 available for processing, type the following.

```
$ MOUNT/FOREIGN/CACHE=TAPE TAPE1: GMB001
```

When you MOUNT the tape volume, the select light blinks. The select light is off and B.O.T. U. or F. is in the display when the tape reaches BOT. The terminal displays a message such as GMB001 MOUNTED ON MUA0:.

THE /FOREIGN qualifier *must* be used when you perform BACKUP commands. It *must not* be used when you perform COPY commands.

For more information, see the *VAX/VMS Mount Utility Reference Manual* (AA-Z424A-TE).

A.1.4 DISMOUNT

DISMOUNT cancels the previous MOUNT command (makes the unit unavailable for processing) and rewinds the TA91 tape. To rewind and unload the TA91 tape, use the following command format.

DISMOUNT logical name:

When the DISMOUNT command is invoked, the tape rewinds. When the rewind is complete and the tape is ready for removal, the drive number is shown in the display.

To rewind to BOT without unloading the tape, use this format.

DISMOUNT/NOUNLOAD logical name:

While the tape is rewinding, the rewind message is in the display. When the operation is complete, B.O.T. (U. or F.) is in the display.

A.1.5 BACKUP

BACKUP provides a means of protection against file volume corruption by creating functionally equivalent backup copies.

To back up a file on the TA91, use this command format.

```
BACKUP/NOCRC/BUFF=x/BLOCK=xxxxx filename.ext device-
name[logical name]:filename.bck
```

Refer to your system manuals before deciding on qualifiers for use with the BACKUP command. For detailed information about BACKUP, see the *VAX/VMS Backup Utility Reference Manual* (AA-Z407B-TE).

You can also COPY files onto the TA91 tape cartridge. See your operating system reference manuals for more information on the COPY command.

A.2 Tape Drive Display Function

The VMS operating system commands MOUNT and DISMOUNT and the VMS system services \$MOUNT and \$DISMOU now support the display function of certain Tape Mass Storage Control Protocol (TMSCP) magnetic tape drives (for example, the TA90 family). To use this function, the Hierarchical Storage Controller (HSC) connected to your system must have a microcode level of Version 600 or later. Table A-1 describes how the tape drive display function works.

Table A-1 Tape Drive Display Function

Tape in drive?	MOUNT command entered?	Tape mounted?	Tape moving?	Display action
no	yes	no	no	Alternates between flashing "MOUNT" and "label," where "label" is the volume label of the tape cartridge you want to mount
yes	yes	yes	no	Indicates the volume label of the tape cartridge (assuming the tape cartridge was mounted using the VMS MOUNT command.)
yes	yes	yes	yes	Indicates the volume label and flashes a dot in lower right corner of the display. The flashing dot indicates that the tape is moving.

Table A-1 (Cont.) Tape Drive Display Function

Tape in drive?	MOUNT command entered?	Tape mounted?	Tape moving?	Display action
no	no	no	no	Indicates the unit number of the drive in the format DRu (for example, DR1). Using the unit number, you can determine the device name of the tape cartridge drive. For example, DR1 could have the device name MUA1.
yes	no	no	no	Indicates "B.O.T.U" (Beginning Of Tape, tape Unloaded).
yes	no	no, dis-mounting	YES	Indicates "UNLOADING."

A.3 Backing Up on the TA91 with VMS

This section provides a general series of steps for backing up files on a TA91 when you are using the VMS operating system. The steps are written assuming the TA91 is device MUA0, and that a tape has been inserted.

1. \$ ALLOCATE MUA0: TAPE1:
2. \$ MOUNT/FOREIGN/CACHE=TAPE TAPE1: GMB001
3. \$ BACKUP/xxxxx/xxxxx filename.ext TAPE1:filename.bck
4. \$ DISMOUNT TAPE1:
5. \$ DEALLOCATE TAPE1:

After step 4, the drive can be attached or allocated by another user/process/ job.

A.4 Data Compaction

When data compaction is turned on, data is compacted during a write operation, and is de-compacted during a read operation. Use the following commands to turn compaction on or off.

```
INIT/MEDIA_FORMAT=[NO]COMPACTION
```

```
BACKUP/MEDIA_FORMAT=[NO]COMPACTION
```

B

Check Code Table

Table B–1 Check Code Table

Check Code	Error Code Definition	Action Required
CHK 02	Open LED in tape path sensor.	Perform the Section 5.10.1, Check Code Recovery Procedure.
CHK 03	A cartridge is present after the message display tells you to remove it.	Perform the Section 5.10.1, Check Code Recovery Procedure.
CHK 04	A tape tension error.	Perform the Section 5.10.1, Check Code Recovery Procedure.
CHK 05	Tape path error.	Perform the Section 5.10.1, Check Code Recovery Procedure.
CHK 06	Tape path error.	Perform the Section 5.10.1, Check Code Recovery Procedure.
CHK 07	The file protect switch is defective.	1. Unload the cartridge. 2. Replace the cartridge.
CHK 0E	A tape path sensor error.	Perform the Section 5.10.1, Check Code Recovery Procedure.
CHK 14	A tape tension error—possible broken tape.	1. Check the cartridge for broken tape. 2. If broken, replace the cartridge. 3. If not broken, perform check code recovery procedure.
CHK 16	Servo failure.	Call your customer engineer.
CHK 17	Timer failure.	Call your customer engineer.
CHK 18	Drive interface failure.	Call your customer engineer.
CHK 19	Drive interface failure.	Call your customer engineer.
CHK 20	A reel null error during a load.	Perform the Section 5.10.1, Check Code Recovery Procedure.
CHK 21	The threading mechanism is slow or stalled during a load.	Perform the Section 5.10.1, Check Code Recovery Procedure.
CHK 22	The threading mechanism was not at the home position during cartridge load.	Perform the Section 5.10.1, Check Code Recovery Procedure.
CHK 23	A reel null error during a load.	Perform the Section 5.10.1, Check Code Recovery Procedure.

Table B-1 (Cont.) Check Code Table

Check Code	Error Code Definition	Action Required
CHK 24	A reel null error during an unload.	Perform the Section 5.10.1, Check Code Recovery Procedure.
CHK 25	A threading mechanism or leader block malfunction.	Section 5.10.1, Check Code Recovery Procedure.
CHK 26	The cartridge latch failed to release or a loader error occurred.	Go to Section 5.7, Cartridge Loader Recovery Procedure.
CHK 27	A tape path interrupt during an unload operation.	Section 5.10.1, Check Code Recovery Procedure.
CHK 28	The tape is not attached to the leader block pin.	Call your customer engineer.
CHK 29	Timer failure.	Call your customer engineer.
CHK 2A	An error at the last wrap null point.	Perform the Section 5.10.1, Check Code Recovery Procedure.
CHK 2B	A mid-tape load failure.	Perform the Section 5.10.1, Check Code Recovery Procedure.
CHK 2C	Excessive file reel motor speed.	Call your customer engineer.
CHK 2D	Short tape in cartridge.	Call your customer engineer to verify defect.
CHK 31	The cartridge loader output tray did not raise.	1. If the loader's Attention indicator is not turned on, press the Unload switch on the Operator panel. If that doesn't correct the problem, call your customer engineer. 2. Go to Section 5.7, Cartridge Loader Recovery Procedure.
CHK 36	There is a problem with the interconnection between the drive and the cartridge loader.	1. If the loader's Attention indicator is not turned on, press the Unload switch on the Operator panel. If that doesn't correct the problem, call your customer engineer. 2. Go to Section 5.7, Cartridge Loader Recovery Procedure.
CHK 40	Parity error.	Call your customer engineer.
CHK 41	Power amplifier board failure.	Call your customer engineer.
CHK 42	Power amplifier board failure.	Call your customer engineer.
CHK 43	Power amplifier board failure.	Call your customer engineer.
CHK 44	A tape tension error.	Perform the Section 5.10.1, Check Code Recovery Procedure.
CHK 46	Air pressure lost.	1. Unload the cartridge. 2. Call your customer engineer.
CHK 47	Air cooling lost. Possible Excessive Component Temperature.	1. Turn off power to the subsystem. 2. Call your customer engineer.
CHK 48	Tach error.	Perform the Section 5.10.1, Check Code Recovery Procedure.

Table B-1 (Cont.) Check Code Table

Check Code	Error Code Definition	Action Required
CHK 49	Counter parity error.	Perform the Section 5.10.1, Check Code Recovery Procedure.
CHK 4A	Speed parity error.	Perform the Section 5.10.1, Check Code Recovery Procedure.
CHK 4B	Clock parity error.	Perform the Section 5.10.1, Check Code Recovery Procedure.
CHK 4C	Gap parity error.	Perform the Section 5.10.1, Check Code Recovery Procedure.
CHK 4D	An analog converted (DAC) parity error.	Perform the Section 5.10.1, Check Code Recovery Procedure.
CHK 51	Timer hardware error.	Perform the Section 5.10.1, Check Code Recovery Procedure.
CHK 60	Thread/load failure.	Perform the Section 5.10.1, Check Code Recovery Procedure.
CHK 63	Thread/load failure.	Perform the Section 5.10.1, Check Code Recovery Procedure.
CHK 68	File reel motor failure.	Perform the Section 5.10.1, Check Code Recovery Procedure.
CHK 69	Tape path sensor interrupt.	Perform the Section 5.10.1, Check Code Recovery Procedure.
CHK 6D	The period counter equals 0.	Perform the Section 5.10.1, Check Code Recovery Procedure.
CHK 82	Interconnection drive error.	1. Unload the cartridge. 2. Call your customer engineer.
CHK B0	A long-loop-write-to-read operation was attempted with a cartridge in the drive.	Perform the Section 5.10.1, Check Code Recovery Procedure.
CHK C2	A parity error on the write card.	1. Unload the cartridge. 2. Call your customer engineer.
CHK C3	A phase locked loop is not synchronized.	1. Unload the cartridge. 2. Call your customer engineer.
CHK C4	Open track on the read/write head or wire is open in cable.	1. Unload the cartridge. 2. Call your customer engineer.
CHK C5	If write enable is active and read bias is not active, the write operation stops with this check.	1. Unload the cartridge. 2. Call your customer engineer.
CHK C6	Write driver failure.	1. Unload the cartridge. 2. Call your customer engineer.
CHK C7	+10.5 V regulator failure.	1. Unload the cartridge. 2. Call your customer engineer.
CHK D0	Wrong IML diskette used.	Insert the correct IML diskette and retry the operation.

Table B-1 (Cont.) Check Code Table

Check Code	Error Code Definition	Action Required
CHK D1	The wrong tape control unit IML diskette is being used.	Insert the correct IML diskette and retry the procedure.
CHK EC	There is a problem with the chassis of the cartridge loader.	Go to Section 5.7, Cartridge Loader Recovery Procedure.
CHK ED	Loader control card failure.	Go to Section 5.7, Cartridge Loader Recovery Procedure.
CHK EE	A failure in the cartridge loader.	Go to Section 5.7, Cartridge Loader Recovery Procedure.
CHK EF	A failure between the cartridge loader and the drive.	Go to Section 5.7, Cartridge Loader Recovery Procedure.

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